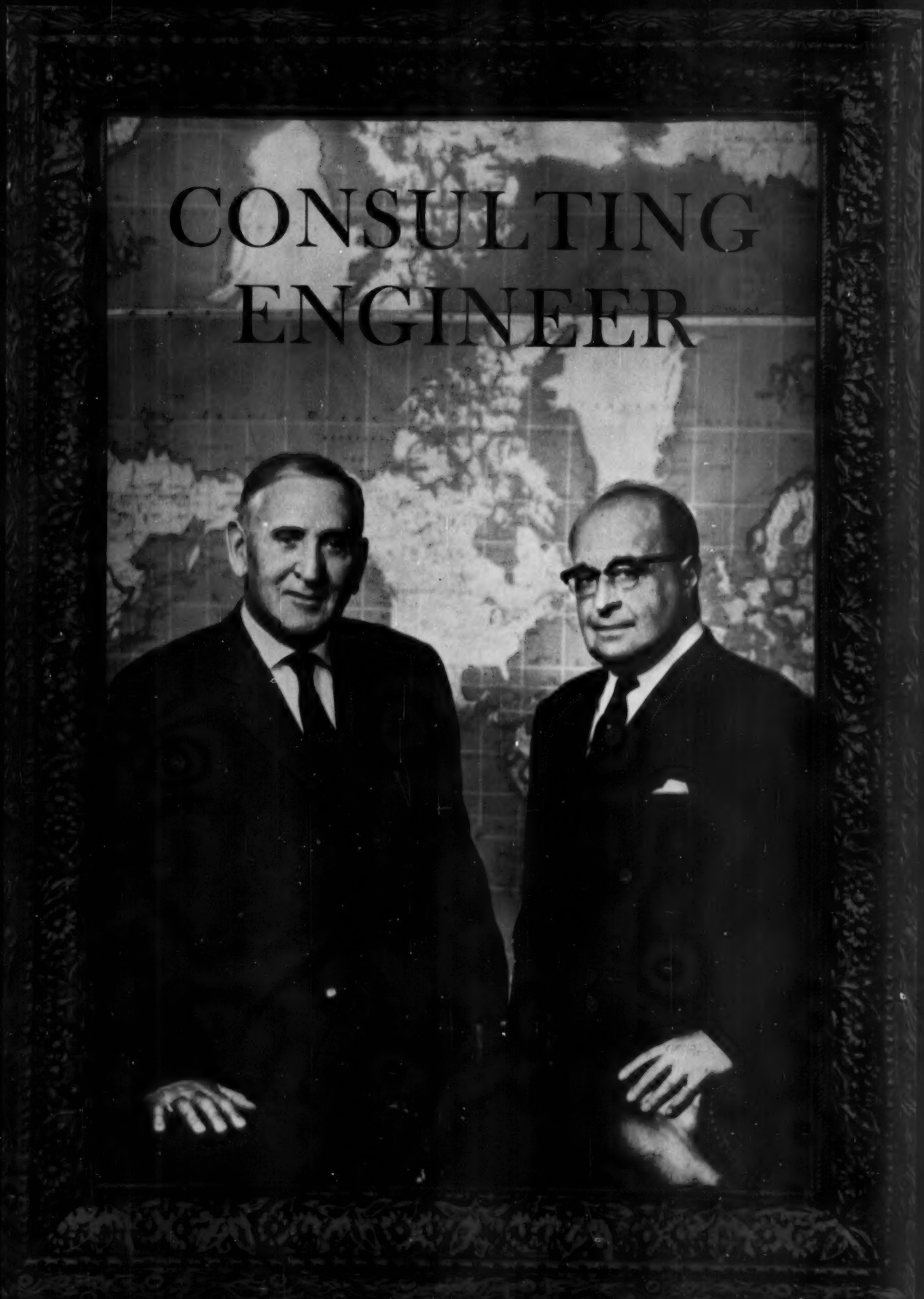
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In addition, gate valves offer a choice of standard-flow or high-flow body ports, both with 1000 Brinell wedges.

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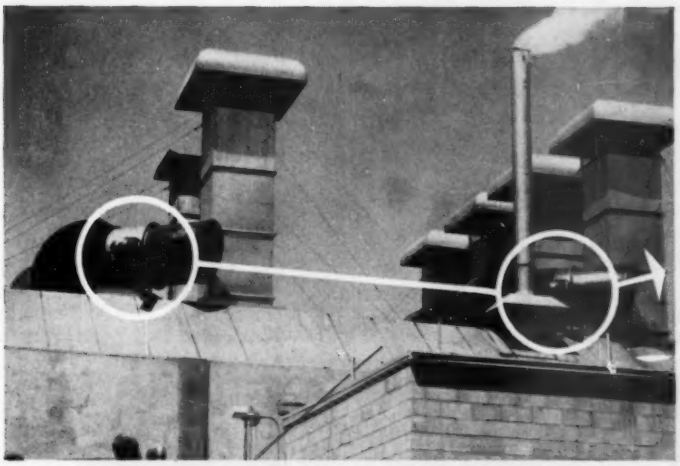
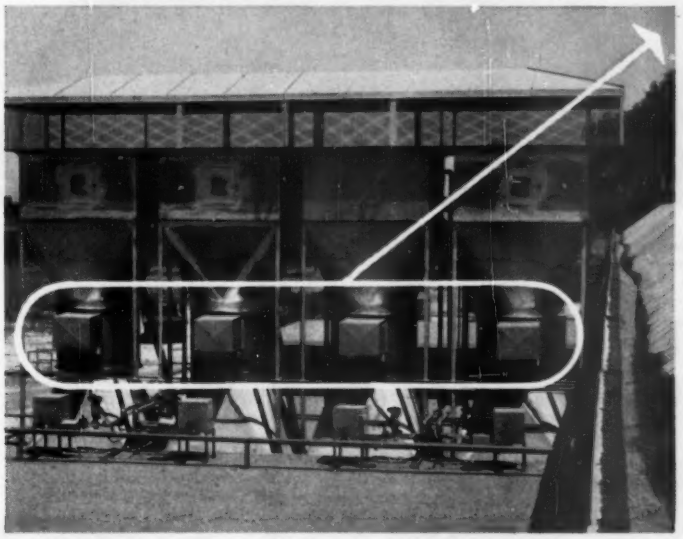
Hartzell belt-drive duct fans withstand heat and moisture

to keep production lines rolling at California Vegetable Concentrates, Inc.





The fan or blower which does an adequate job under routine operating conditions won't necessarily stand up when the going gets tough. Hartzell air moving equipment is designed and built with a plus capacity that allows it to take rough jobs in stride.

Typical of the unusual jobs which are a natural for Hartzell fans and blowers are these installations at California Vegetable Concentrates, Inc., Modesto, Cal. The top photo shows two of the five 44", 3 h.p. Hartzell belt-drive duct fans which exhaust 26,200 cfm of hot, wet air from a belt-type continuous vegetable dehydrator.

The lower photo shows four 48", 10 h.p. Hartzell belt-drive duct fans which supply heated air for a tunnel-type dryer. Each of these fans moves 30,800 cfm thru a gas fired heater (shown at the top of the stack). These fans are exposed not only to the high temperature of the entering air but to extreme radiant heat from the burners themselves.

Fan failure here would cripple the entire operation, but the customer reports that in 15 months of operation these fans have required only a minimum of routine maintenance. No damage due to heat or moisture has yet been detected.

For specific recommendations on how rugged, reliable Hartzell fans and blowers can help you solve your air moving problems, get in touch with your nearby Hartzell field engineer. If you don't know him, drop us a line for his name and address.

These installations were handled by the Hartzell field office at Santa Clara, California; P. O. Box 144, phone Cherry 3-3217.

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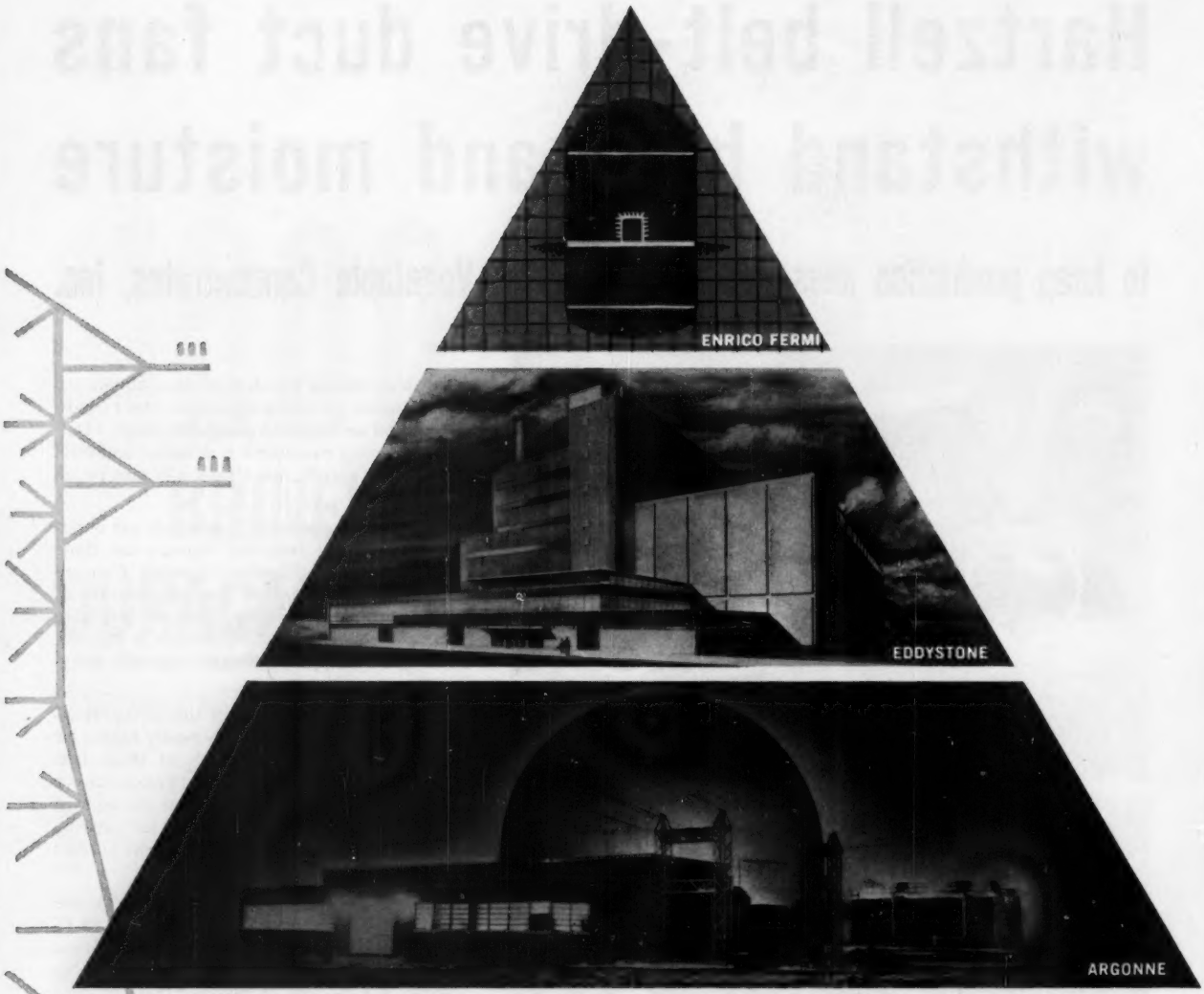

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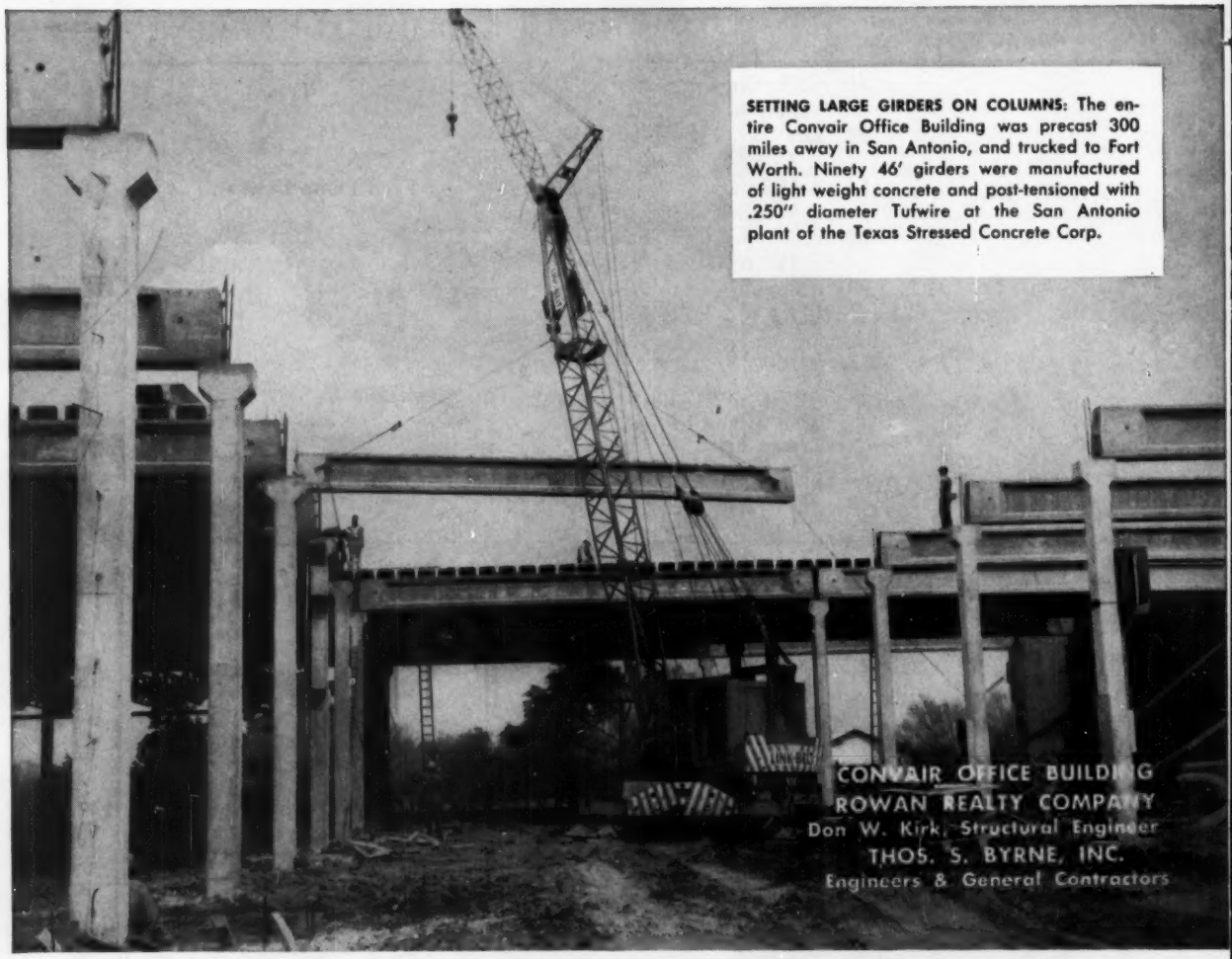
BPA

Prestressed Concrete Building



SETTING LARGE GIRDERS ON COLUMNS: The entire Convair Office Building was precast 300 miles away in San Antonio, and trucked to Fort Worth. Ninety 46' girders were manufactured of light weight concrete and post-tensioned with .250" diameter Tufwire at the San Antonio plant of the Texas Stressed Concrete Corp.

Products Manufacture and Erection: Texas Stressed Concrete Corporation, San Antonio, Texas

Completed in 4 Months—Despite Record Rains

The rains came. For 22 days the construction business in Fort Worth, Texas, slogged through a deluge that meant delays ranging from slow-downs to shut-downs. You can't pour concrete in the rain.

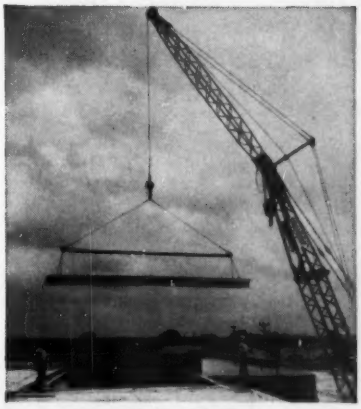
In the midst of this, an outstanding advantage of prestressed concrete construction was dramatically demonstrated — speed of erection even under adverse conditions.

The 102,000 sq. ft. Convair office building and warehouse is the case in point. The prestressed concrete structural members were erected in 13 working days — rain or no rain. The building was complete—offices, air-conditioning and all — in less than four months.

Speed of erecting is only one of many advantages that make prestressed concrete the miracle building material. Others are: great strength-to-weight ratio; less concrete needed; greater recovery after overloads; thinner sections; on schedule transportability of prestressed members; longer spans; permanence of concrete PLUS amazing flexibility and elimination of cracking; adaptability as unlimited as the imaginations of architects and engineers. Today, prestressed concrete is being used in a range of applications from fence posts to giant bridges and multi-story buildings; from movable parking lot curbs to airport runways.

Advances in the development of better high tensile strand and wire by Union Wire Rope Corporation have contributed heavily to the booming trend to prestressed construction. Once the problem of dependable tensioning materials was whipped, the way was opened wide for the "new age of concrete."

Erected In Only 13 Days



CLOSE-UP OF DOUBLE TEE BEING SET: Tuffy Slings were used as shown in placing 920 of these 4' double tee slabs. Slabs were made from lightweight concrete using Union Wire Rope "Tufwire" strand.

BUILDING ALMOST CLOSED IN: Work progresses steadily in the dreary rain as another double tee is hoisted into position. The roof structure was designed for parking. It was given a thick asphalt wearing surface.

LAST OF THE DOUBLE TEES ARE HOISTED FROM TRUCK completing roof for asphalt surface.

How Will You Share in Vast New Markets Opening For Prestressed Concrete Makers?

Looking for a new route of expansion? Want to get in on an industry that's expanding at a tremendous pace every year, with a future of fantastic dimensions? Prestressing offers opportunities not only to the on-site contractor, but also to the contractor who would like to operate a permanent casting yard as an arm of his business or as a commercial fabricator. Here are some of the opportunities:

OPPORTUNITIES in Buildings: Structures of just about every description are being built better with prestressed concrete. Office buildings, garages, warehouses, schools, motels, hospitals. Now the walls of multi-storied buildings are being poured in big slabs with openings for doors and windows, then tilted up to position. Floors are poured in "layers" separated by greased paper, then raised to upper floor levels.

OPPORTUNITIES in Bridges: The tremendous National Highway Program now under way calls for 300,000 bridges, most of which can be built much faster and more economically with prestressed concrete than with any competitive building material. Other bridges ranging from a small creek crossing to the world's longest highway bridge are built of prestressed concrete.

OPPORTUNITIES in Highways: Prestressed concrete pavement is already in the advanced experimental stage. The slabs need be only 5 inches thick, as contrasted with the ordinary 10-inch slabs used on many highways. They promise high levels of strength and permanence, speed of construction, savings in time and money. And more profit for suppliers and contractors.

These are just a few of the many uses where concrete prestressed with Union Tufwire strand and wire is proving its structural and economic advantages. Almost anything that concrete will do — it will do better when prestressed with Union Tufwire.

If you're a present user of prestressed concrete, or engaged in making it, let our engineering department and research laboratory give you and your consulting engineers a lift with any prestressing project.

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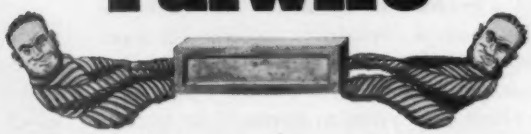
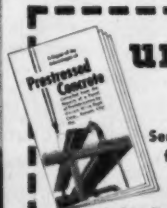


Stress-Relieved Wire and Strand



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Armand N. Tourne (left) and Johannes Rosenthal

Europes' Leaders *(Cover)*
Belgium and Berlin —

THE PRESIDENTS of two European consulting engineer associations, Monsieur Armand N. Tourne of *Chambre des Ingenieurs-Conseils de Belgique* and Herr Johannes Rosenthal of the Berlin Section of *Verein Beratender Ingenieure,* met in New York City recently. Tourne was in Manhattan for the International Congress on Large Dams. Rosenthal was here to visit American consulting engineers.

The two, whose organizations are members of the International Federation of Consulting Engineers (FIDIC), found more similarities than differences in their countries' professional problems. They explained that the aim of FIDIC is to establish standards of consulting engineering ethics and share information on methods of practice. As a result, engineers from different European countries find that they now can band together without difficulty to handle large international projects.

Rosenthal of Berlin

Rosenthal, a graduate of the Berlin Technical University, has been a consulting engineer for more than 37 years. He lost everything he owned during the last war, and he found that it takes a consulting engineer about four years to re-establish contacts and get a consulting practice back on its feet. Wounded and captured by the Russians during the battle of Berlin, Rosenthal was released to return to his divided city. He lived for a number of years after the war on what his family could get through the sale of family heirlooms. Pieces of 200-year-old china, which had been handed down in the family, were sold to obtain money for food.

However, Rosenthal's practice now is thriving again. Currently, his firm is handling 90 projects for both private and government clients. A structural engineer, Rosenthal's specialty is the design of apartment houses, large office buildings, and industrial facilities. He also designed the largest brewery in Berlin, a large printing plant, several warehouses, and a number of churches.

Tourne of Belgium

And World War II also meant the end of a lucrative consulting practice for Monsieur Tourne. For him, the war was over just in time. "I had just $10 left in my pockets," he recalled.

Tourne's specialties are buildings and public works projects. In addition to his own consulting practice in Brussels, he is administrative director of *Cie Africaine Des Ingenieurs-Conseils* (CADIC), which was formed by 30 members of the Belgian Chamber. It has offices in Brussels and Leopoldville, capital of the Belgian Congo. This group has designed more than 1000 kilometers of highways, 30 bridges, a lock on the Kwango River, and a sewage system for Leopoldville.

In addition, CADIC now is collaborating on the Inga Project in the Belgian Congo. Currently in the final design stage, the project includes a 30-thousand kilowatt power station and several large dams.

Tourne also is president of Interconsult: International Group of Consulting Engineers. This is a group of five consulting organizations which have banded together for the purpose of handling projects of any type internationally. Tourne is a member of this group through his affiliation with CADIC. The international organization includes consulting organizations from Belgium, Holland, Germany, France, and Austria. It is incorporated, and has offices in The Hague.

The Same Competitors

Over breakfast at the Waldorf, Rosenthal and Tourne told of the problems and pleasures of private practice in their own nations.

Who is competing with the independent consulting engineer in your countries?

The two agreed—"moonlighters," "sundowners," "kitchen sink" engineers—generally government employees who do design work in their spare time. Not being members of the consulting engineer organizations (they are frequently only technicians), they are not subject to association discipline.

Rosenthal pointed out that the largest new bridges in West Germany were detailed by government workers or employees of manufacturing firms who wanted to make a little extra money.

In Germany, this problem currently is coming in for a great amount of discussion. An effort is being made to pass a law stating that only engineers with a special license are to be allowed to do design work. Currently, there is no required registration of any kind.

In both nations, the consultants compete against a certain amount of "free engineering" from indus-

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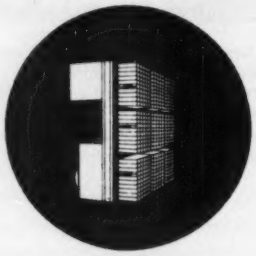

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try. However, this is not sufficient domestically to be considered a serious problem. In Germany, most of the "free engineering" is in such things as electrical design for buildings. "When knowing clients want an expert, they go to the consultants."

In Belgium, the engineering shortage is so severe that there is more than enough work for all. Therefore consultants are not worried by "free" engineering competition.

How well paid is consulting engineering in Belgium and Germany?

In Belgium, the consulting engineer—not the government—designs most of the larger projects, except highways and waterways. As a result the income of the consultant is generally "well above the average," Tourne said.

In Germany, all sewer, gas, and other public utilities are designed by city officials. West Berlin has a staff of 700 engineers designing bridges, waterways, and rapid transit highways. This is one city employee for every consulting engineer in Germany. However, there are so many projects under way that no consultant is idle.

Tourne and Rosenthal were asked how much they would receive on an hourly basis for court appearances, or engineering work that could be paid for on an hourly basis.

The Belgian consultant gets about $6 an hour. The German consulting engineer gets about $3 an hour. This sounds low but is considered rather good when compared with other professional incomes. Also, most projects are on a percentage fee basis and percentages are close to those charged in the U.S. "It is not as good as it should be," Rosenthal agreed. "In Germany, the government strictly regulates fees and conditions of practice. Since 1936, living costs have increased about 3½ times, but consulting fees have not gone up that much."

Who selects the consultant, and who pays him?

At one time in Germany, consultants in interprofessional practice were paid by the architects, as they are here in the U.S. Now the engineering fee is computed separately. However, the relationship between the architect and the engineer is a congenial one. "Frequently the architect is the one to request that a certain consulting engineer be retained for a project," Rosenthal added.

The German consultant works closely with the contractor, but does not have to negotiate with him. The primary problem here is the contractor who always wants to provide all of the detailed drawings "free"—hardly an exclusive problem.

In Belgium, the consulting engineer usually is selected by the contractor. Before a consultant is selected, a number of engineers are asked to submit drawings. The best, in the judgment of the contractor, is selected. Others are paid nothing. The

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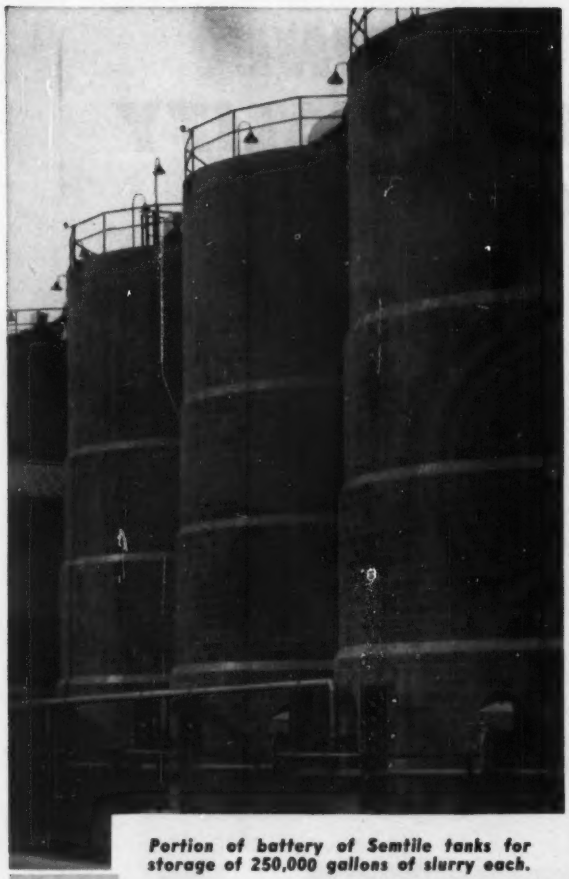

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result is that a consultant is lucky to get the award for one out of every eight or ten of his designs.

Also, this arrangement results in contractors price shopping. Tourne said, "We would like to change this arrangement, but it will be difficult. It is established."

The Belgian system, with the client retaining the architect but the contractor selecting the consulting engineer, is not unusual in Europe. "They use the same system in Austria," Tourne said. "Some say it leads to more originality in engineering, with heavy competition for engineering excellence."

On government projects in both Belgium and Germany, the architect and the consulting engineer are selected by government officials.

What do your consulting engineer associations discuss at their meetings?

Meetings are enough like those of any local Consulting Engineers Council group for an American consultant to feel right at home. They discuss the traditional problems—fees, contracts, relationships with clients, architects, and contractors, engineering duties connected with various projects, government relations, ethics, and "free engineering."

How are ethical violations of members handled?

In Belgium, a member who "fails in his duties" can be expelled from Chamber membership. "But this has never happened," Tourne hastened to add.

In Germany, such problems are handled in a "quiet way." Rosenthal pointed out, "We do not have much of a problem because we take in members only of our own kind. In order to join the Berlin group, a consultant must be experienced, have a good professional and personal reputation, and be free from debts." This last requirement might be considered a bit stringent by most Americans.

How old is private practice as a profession in your countries?

The first consulting engineer in Germany was Mueller-Breslau who opened an office in Hanover in 1870 and designed a steel dome for a Berlin cathedral. In later years, Mueller-Breslau also was the leading professor of statics and structural steel designing at Berlin Technical University.

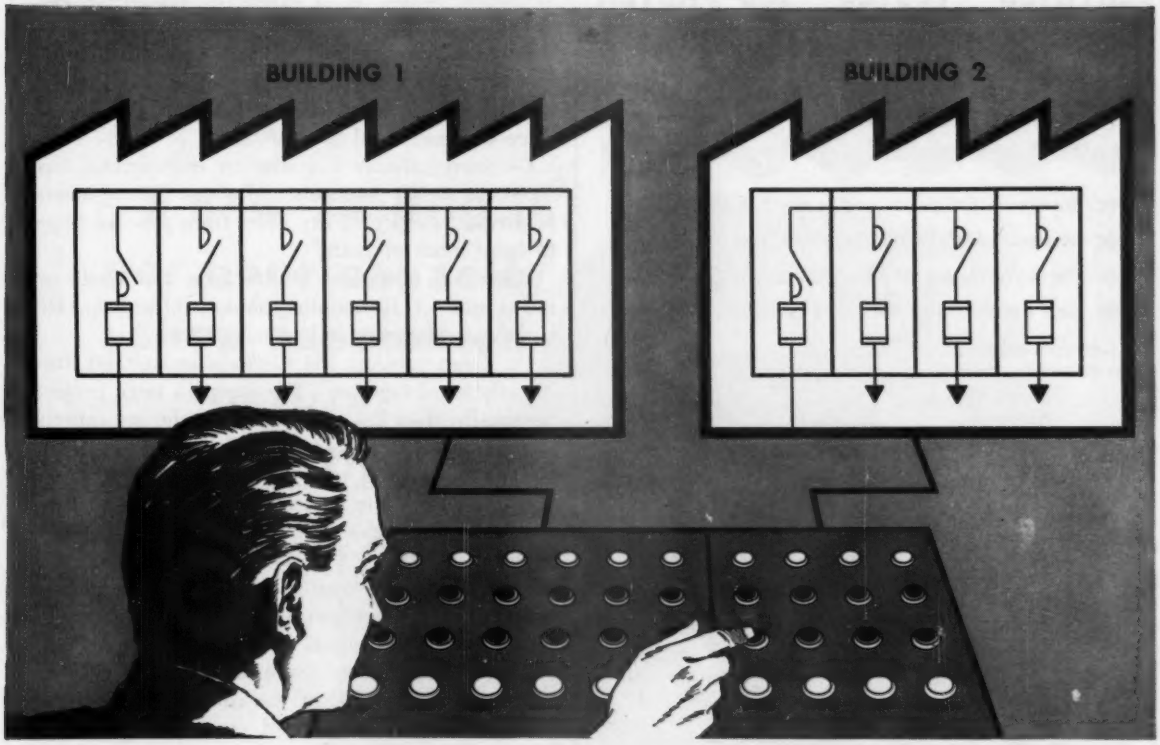
Belgium has had consulting engineers for about 60 years. The first was M. Francois, a young civil engineering professor at the University of Brussels. On one of his initial projects, he redesigned a movable canal bridge mechanism, reducing operating personnel requirements from 20 to three men.

How many consulting engineers are there in your country, and how large is the average firm?

Belgium has about 14,000 graduate engineers, but only about 300 are consulting engineers. Chamber membership is 100.

Most of the civil engineers in Belgium are members of the *Federation des Association Belges D'In-*

R&IE POWER SWITCHING CENTERS



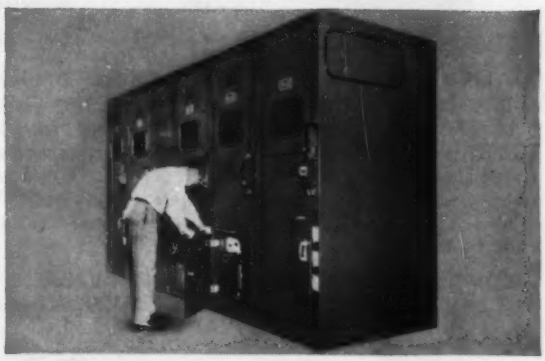
REMOTE POWER CONTROL

with lower-cost electrically controlled and pneumatically actuated R&IE Power Switching Centers for load center power distribution

Scan a control panel for immediate position information about remotely located interrupter switches. Then merely press a button to open or close a switch as the situation warrants. This is the new convenience and efficiency offered by fast acting, electro-pneumatically operated R&IE Power Switching Centers . . . at significantly less cost than either motor driven or hydraulically operated switching systems.

Only simple low voltage wiring is required between a power switching center and its pushbutton control panel. Actuating force is supplied by a double-acting industrial type air motor installed in each switch cubicle. Pneumatic pressure is provided by a standard nitrogen cylinder or by dry compressed air from the plant system. One cylinder contains sufficient pressure for up to 500 complete operations.

R&IE Power Switching Centers are available in ratings from 4.8 through 14.4 kv, 600 through 2000 amp. Also automatic control can be supplied as a function of overload, loss of preferred voltage or other specific conditions. For complete information, contact your nearest I-T-E sales office or write R&IE Equipment Division, Greensburg, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ontario.



Compact R&IE Electro-Pneumatic Operator mechanism fits into standard size cubicle when necessary. Conveniently located poppet valves permit local pushbutton operation. All R&IE Power Switching Centers use HPL-C interrupter switches with 250,000 kva safe closing ratings—1,000,000 kva with current limiting fuses. Bus is made of high conductivity, heavily silverplated aluminum.

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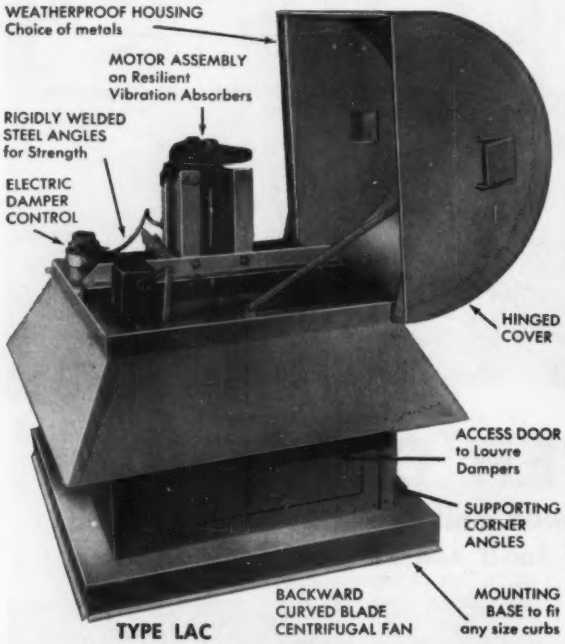
★ *Maximum Efficiency under any conditions*
★ *Minimum Installation-Service Costs*
★ *Perfectly Balanced Fan-Statically & Dynamically*
★ *Self Contained for any type of building*



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H-P Power Ventilators are designed to exhaust around their entire periphery with an outlet area for the highest possible efficiency. Outstanding features shown above insure years of trouble-free operation. Units are engineered for maximum performance and long life — at the right price. Many sizes and speeds to meet your requirements.

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WRITE for Fact-Filled Catalog No. 59. Shows complete line, ratings, capacities, or consult Sweet's Architectural, Plant Engineering and Industrial Construction Files.

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genieurs. This group, with about 95 percent of the membership employee engineers, has a strong voice in public affairs. It is somewhat similar to our National Society of Professional Engineers.

Belgium has no really large consulting firms when compared to American organizations. Tourne said the larger Belgian firms have an average of three engineers and 20 draftsmen.

Germany, always a leader in engineering, has 35,000 to 40,000 engineers and about 700 engineers in private practice. "Fifty years from now we hope to have more of both."

Rosenthal said most of the firms are small—he has a staff of 10 counting stenographic help. He has three engineers and two draftsmen.

On large projects the German consultants frequently band together. "We accept a large project personally, then call in our friends who are experts in the various phases of engineering."

Where are most of your projects?

Rosenthal has no projects outside of West Berlin. Other men in his association, however, do some outside work. Since East Germany permits no private practice, the West Berlin consultants necessarily are limited to operations in their own sectors of the city or to projects in the West.

However, in Berlin, there is enough rebuilding scheduled to keep all of the consulting engineers busy for at least the next six years. "When that is completed," Rosenthal said, "we can think about remodeling some of the older structures which were not damaged by the war."

How do European technical educational standards compare with those of the United States?

Rosenthal and Tourne, who both completed five-year engineering courses, said many European youths come to the United States for graduate studies and basic engineering experience, which speaks well for American graduate schools and American industry. It was pointed out, however, that few engineers in this country have as good a liberal education as their European counterpart. Tourne, for example, had seven years of Latin and five years of Greek.

Rosenthal had nine years of Latin, seven years of French, and six years of English. After his graduation, and three years as a draftsman and designer, he came to the U.S. to get some industrial experience. He spent several years with Carnegie Steel Co. and Koppers Co. "At least," he said, "I learned American English." He once translated a speech for a German friend who was to present it in London. After it was given, the audience congratulated the speaker on the content but complained that it sounded so American they could hardly understand it. "They just don't grab our gab," Rosenthal explained. ▲▲

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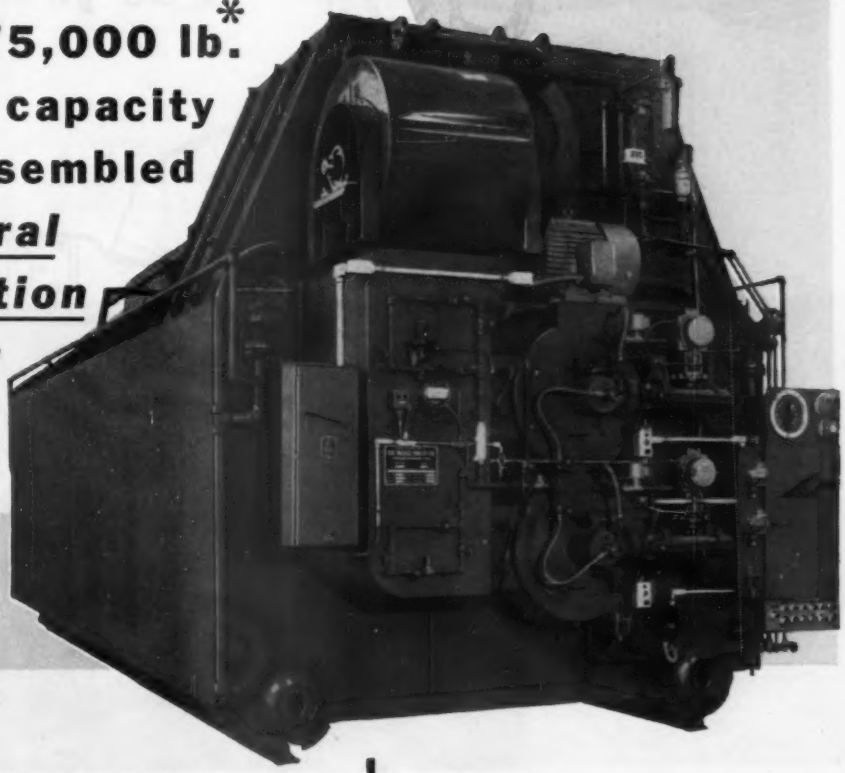
a new 75,000 lb.* per hour capacity shop-assembled *natural circulation* boiler



*75,000 lbs. per hour present capacity.
80,000 lbs. per hour future capacity with economizer

Wickes Type A units are of simple design, ruggedly constructed and adaptable to a variety of operating conditions and may be Oil or Gas Fired.

All units are shipped completely shop-assembled including superheater fuel burning equipment, safety and combustion controls, forced draft fan and drive, soot blowers and feedwater regulator.

Save on

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- Operating Expense
- Space
- Delivery Time
- Installation Time

For more detailed information on Wickes Type-A steam boilers, write for our catalog 56-1. Bulletin 55-1 covers the complete line of Wickes Products and Facilities.

WICKES typeA

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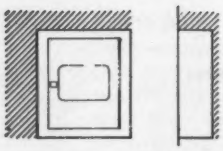
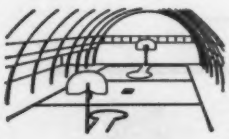
169

"Greatest improvement in Standpipe Fire Protection in 50 years!"

New... ALLENCO HOZEGARD CABINETS



- **Save Space**—35% less area, less depth; not limited to walls, may be installed on any plane, even floors*



- **Cut Cost**—save 25%-30% on each unit installed, by eliminating costly pin-type rack and time of loading hose on it

- **Serve Best**—foulproof door-rack swings full 180 laterally *or* vertically; hose "points" faster, reaches further

- **Pre-proved**—thoroughly tested; *first* complete fire hose cabinet unit, including equipment, to be 100% Underwriters Listed

**using appropriate framing and solid (no glass) door*

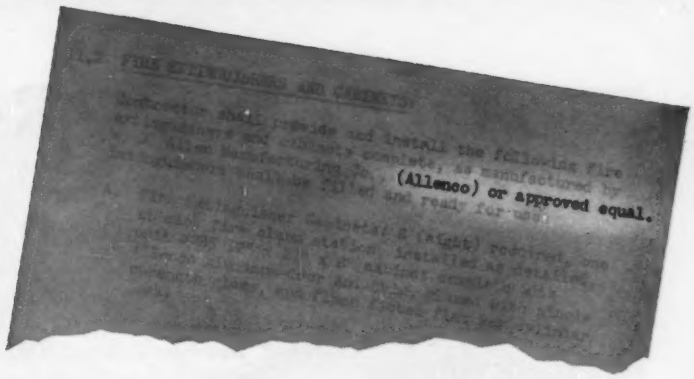


Fig. 7168
19"x22"x5½" I.D.
Holds 50 or 75-feet
of 1½" linen hose

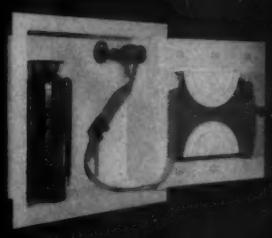


Fig. 7169
26 x27"x8" I.D.

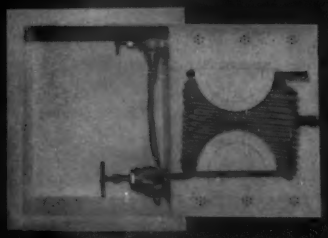


Fig. 7172
24"x30"x8½" I.D.

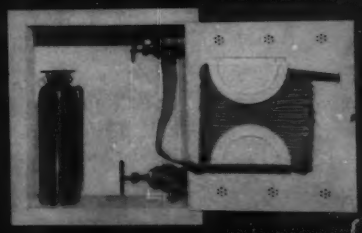


Fig. 7173
27"x30"x8½" I.D.

Each holds up to 100 feet of 1½" linen hose, 50 or 75 feet of Allen-flex hose, or 50 feet of Qua-flex hose, plus choice of extinguishers where shown and Fire Department valve where shown.

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The Readers' Guide

Council Accepts Members-at-Large

There is one action of particular importance reported in our summary of Consulting Engineers Council's recent meeting in Dallas (page 80). The Council (which up until now has been strictly a federation of 20 associations of consulting engineers spread about the country) has established a new class of membership to be made up of "members-at-large." This means that firms of consulting engineers located in areas in which there is no association affiliated with the Council now can participate in Council activities as members-at-large. Whenever an association is established in their area, they would become members of the local group and be represented in the Council through the association. The executive secretary, Larry Spiller, says that firms interested in membership-at-large should write him at CEC headquarters, 326 Reisch Bldg., Springfield, Illinois.

Research Responsibility

There is an outstanding article in this issue dealing with a technical topic. "A Comparative Engineering Analysis of Feed Pump Drives," by F. A. Ritchings, Jr. and Michael W. Larinoff, of Ebasco Services (page 84) summarizes the results of an intensive study of the subject, conducted over the past year. Ebasco is to be congratulated on this study project, the results of which will benefit every consulting engineer called upon to design and specify feed pump systems. It is not too often that one finds a consulting firm undertaking research of this nature. Too many consultants depend on manufacturers for equipment studies. Consultants emphasize to their clients the importance of independent engineering services, yet the consultant himself is inclined to depend on studies of one or two manufacturers in selecting equipment for his clients. It is good to see a firm (albeit a large one) undertake independent investigation of equipment and its arrangement.

International Federation

The Consulting Engineers Council has just accepted an invitation to join the International Federation of Consulting Engineers (FIDIC), so this means that all 1200 members of the associations in CEC now are affiliated with the nearly 2500 European consulting engineers whose associations are also members of FIDIC. Consulting engineers in Switzerland are members of *Association Suisse des Ingenieurs-Conseils* which is a member of FIDIC, so it should be interesting to see what the engineers in this little European democracy are doing, professionally and technically. (See "Report from Switzerland, page 106.) The engineers of Switzerland always have taken an active part in the International Federation, and they will feel the loss of Robert Naef, of Zurich, who was killed last month in an automobile accident. Naef was the first foreign engineer to appear on the cover of CONSULTING ENGINEER. At the time of his death he was treasurer of FIDIC. He also was a past president, his term immediately preceding that of current president Julian Tritton, of London.

Law and Ethics

There are many consulting engineers who run to their state registration boards the minute they hear of a colleague engaging in some unethical practice. There is nothing wrong with this, for there is all too little policing of the profession, but it is seldom that the registration boards can do anything about it. This is, as Dean Joseph Weil of the University of Florida points out, because registration boards are not set up to deal with ethics, but must confine their activities to law – and to only certain parts of the law at that. The Dean thinks that more engineers should understand the difference between unethical actions and illegal actions by engineers. He suggests that unethical actions be handled by engineering societies, for registration boards are not given the authority to deal with that aspect of professional practice. His points are important and should be read with care. See "Ethics, Law, and Registration," starting on page 109.

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Advance KOOL KOIL Fluorescent Lamp Ballasts are the result of 3 years of research, development and testing. They incorporate new grades of steel, wire, insulation and compounds. They operate cooler, give more light output and increase ordinary ballast life 3½ to 4 times.
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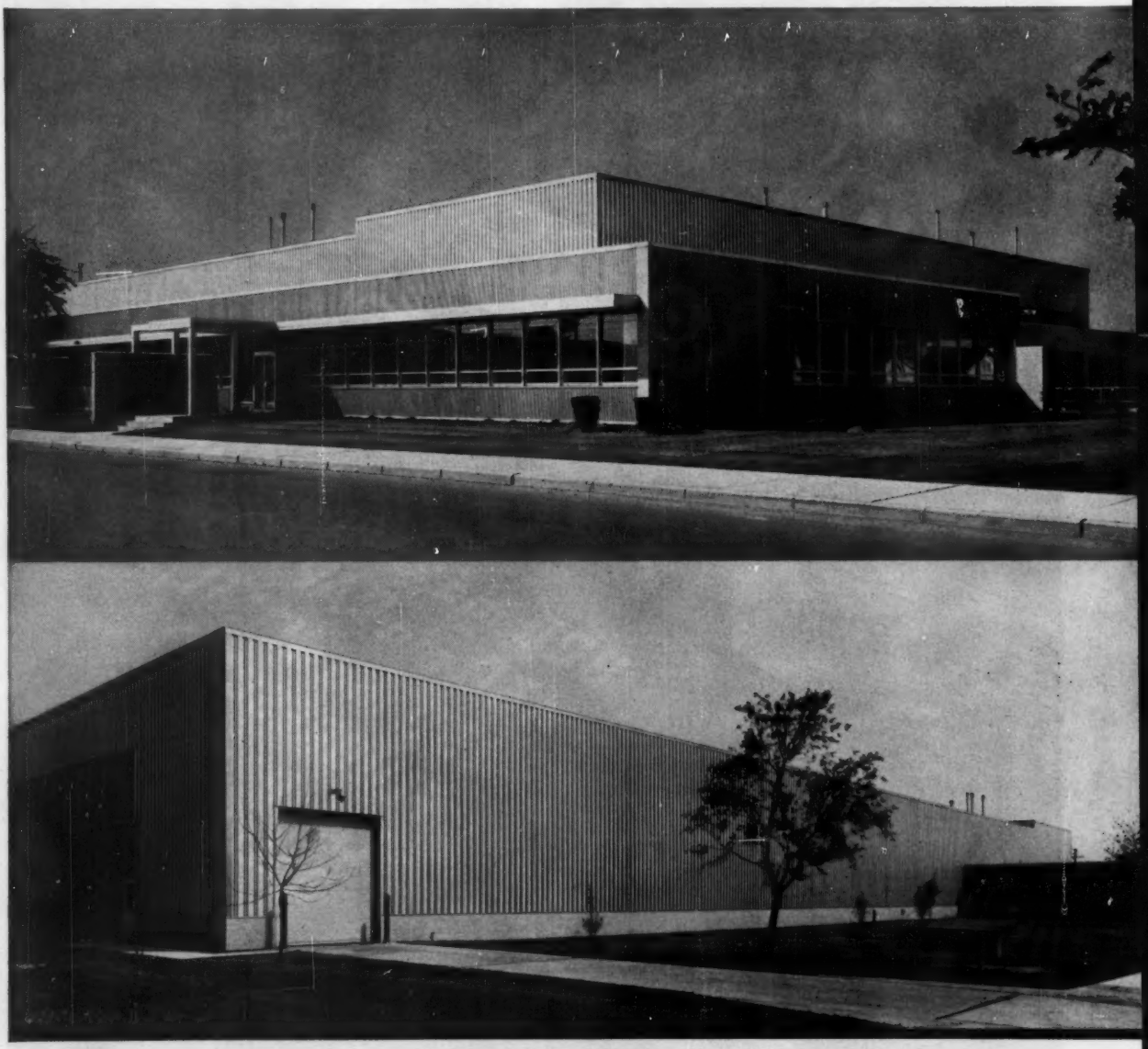
Mahon METAL CURTAIN WALLS



New Metals Service Center for Copper & Brass Sales, Inc., Detroit, Michigan. Mahon Aluminum Curtain Walls were effectively employed in the design of this attractive structure. Giffels and Rossetti, Architects-Engineers. Perron Construction Company, General Contractors.

Serving the Construction Industry Through Fabrication of Structural Steel, Steel Plate Components, and Building Products

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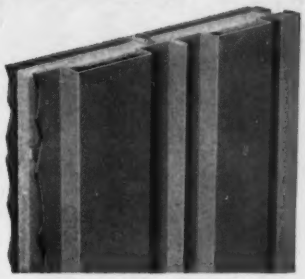
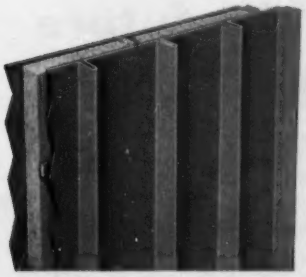
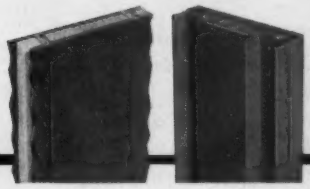


MAHON FLUTED WALL
FIELD CONSTRUCTED



MAHON RIBBED WALL
FIELD CONSTRUCTED



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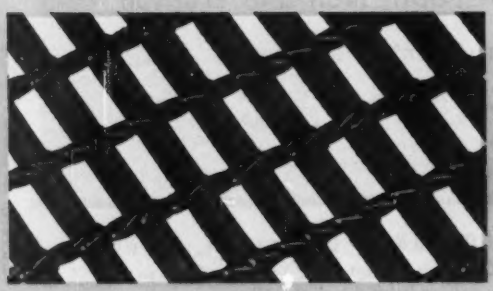
150 years ago it was demonstrated that steamships could never cross the Atlantic and as late as 1903 it was proved that man could not fly, so, we believe, it is not unreasonable to say that our grating will be in use on other planets in the not-too-distant future.

Already, in a short span of 12 years, we have become one of the leading grating manufacturers in the world today. Our installations are located all over the United States and in many foreign lands. One of our latest is on the largest steel island . . . for Freeport Sulphur Company. (See photograph at right). Here, approximately 300 tons of our galvanized welded steel grating have been installed.



Spiral bars are Weldforged into bearing bars to form solid, one-piece units. Spirals alternate right and left and are slightly raised above bearing bars for greater safety underfoot.

Having pioneered many new designs and improvements in the grating field, today we are in position to furnish grating for every possible need . . . in steel, stainless, or aluminum; and in welded, riveted, pressure-locked, or our new Roll-Lock, designs. We invite your inquiry for our new catalogs. Address: Dep't CE-12.

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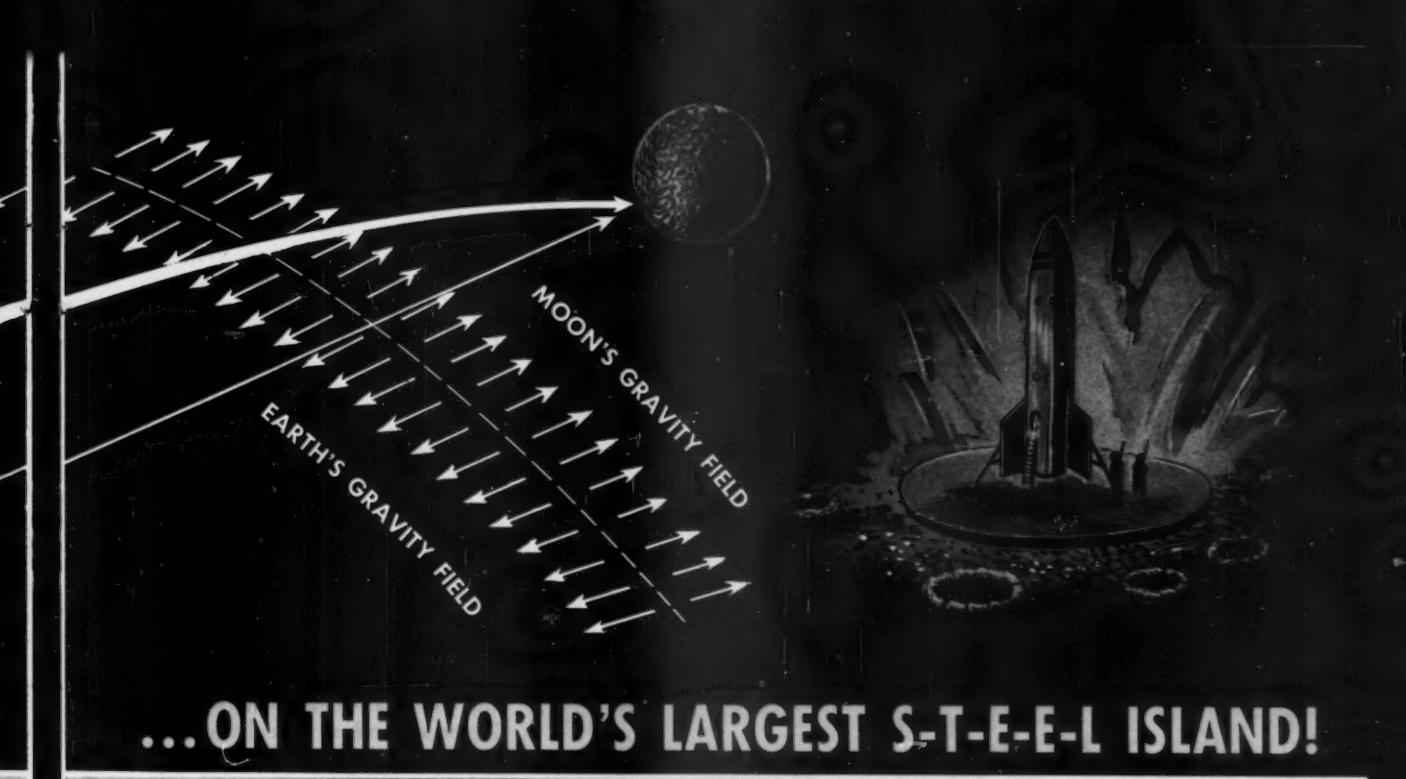

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World's largest steel island 7 miles off the coast of Louisiana. This first off-shore sulphur mining plant is V-shaped, stretching for ½ mile and reaching 60 ft. above the water. Structure is principal part of a $30 million project undertaken by Freeport Sulphur Company to develop a major new sulphur deposit known as Grand Isle.

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Readers' Comment

The Party Line

Sir:

I was amazed and angered when I read the following remarks on page 30 of the November issue.

"We scarcely can afford it. The railroads are determined to kick us out. They say we cost them too much money, particularly if we are so finicky as to want to use a Pullman car. If we eat in the diner, they say they lose even more money on a $1.50 meal served for only $4.80 at a crowded table."

What, may I ask, is to be gained by anyone writing such drivel in CONSULTING ENGINEER, except to reveal that there are crackpots, socialists, and near-Communists behind the scenes here, as elsewhere.

After reading that kind of stuff I could not believe anything else I might read in the magazine, so you may as well stop sending it to me.

Carroll H. Shaw
Consulting Engineer
New York, New York

Credit Correction

Sir:

We recently sent you outline copy information for release in a feature article to appear in an issue of CONSULTING ENGINEER, on the new Honolulu International Airport terminal facilities. In the letter, credit for design of the project was given to Theodore A. Vierra, Architect, and the firm of Law and Wilson, Engineers, both of Honolulu, T.H.

In the article appearing in the November 1958 issue of CONSULTING ENGINEER, page 87, Quinton Engineers, Ltd. was given credit for designing the administration building. This statement is embarrassing to our firm, and we request that a correction appear prominently in the December issue of the magazine.

R. O. Kusche, President
Quinton Engineers, Ltd.
Los Angeles, California

Professional Ploy

Sir:

Paul Rogers' delightful article on build-up for engineers was especially interesting to me since he included my name with that of General Sverdrup. Up to this time my name certainly has not been previously coupled in print with the names of General officers.

Harry Terry (Colonel)
Consulting Engineer
Trenton, New Jersey

Problems of Practice

Sir:

The Iowa Association of Consulting Engineers is at the present time attempting to establish standards of service with the proper fee schedule to permit a professional standard of service. The Study

Committee is under the guidance of Ralph Wallace, Professional Engineer of Mason City, Iowa. Since the problems are not confined to the State of Iowa, and a successful solution must encompass at least neighboring states, the following comments are offered for concerted action.

One of the major problems that we have is county and local governmental units taking quotations from a number of firms on the same project. The problem is magnified when the governmental unit has not pinpointed the project in mind. This firm has been in existence barely more than a year and, because of this, has faced this problem probably more than its share. The awarding of work invariably is on a basis of fees. This, I agree, must stop.

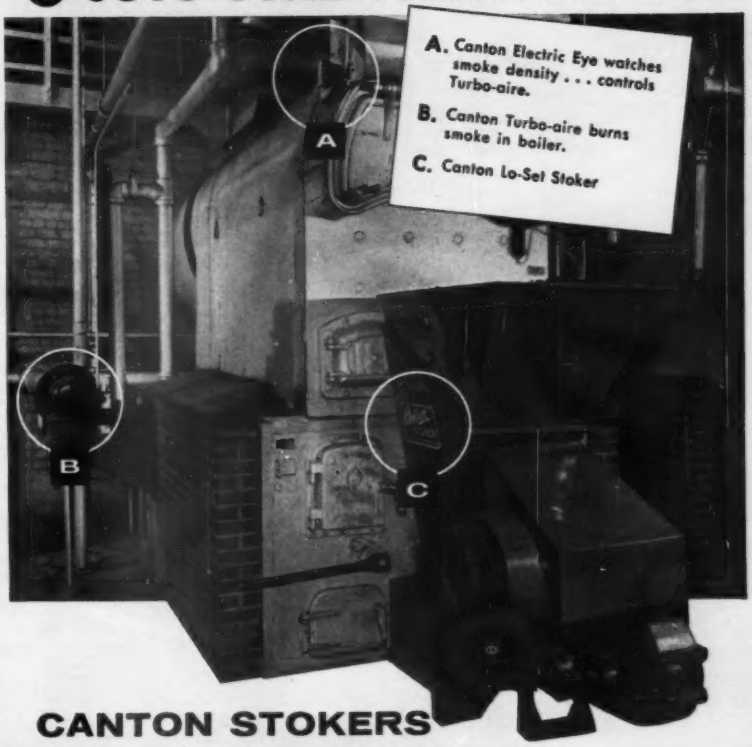
To accomplish our objectives, large firms should get together and bury the hatchet. They should recognize the moral ramifications of taking more work than they can satisfactorily handle just because they can point to an impressive clientele and experience record. Within our fields of experience, we know some of this has been done.

We should do everything to encourage thoughts toward private practice among our young graduates. I consider the major problem of the engineering profession to be the hordes of young engineers going on government payrolls. Being a former member of the horde, I have records contradicting the viewpoint expressed by the Bureau of Public Roads – that consultants' services are more costly than those incurred by government engineering forces. At least on that work with which we are familiar, the direct opposite is true.

If all of these problems are kept in mind – giving more credit to the individual engineers – I believe we can advance a major milestone in our objectives.

James W. Powers, P.E.
Powers & Associates
Iowa City, Iowa

Here's the team that
❶ ELIMINATES SMOKE
❷ CUTS COAL TONNAGE 17.5%


A. Canton Electric Eye watches smoke density . . . controls Turbo-aire.
B. Canton Turbo-aire burns smoke in boiler.
C. Canton Lo-Set Stoker
A
B
C

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WITH TURBO-AIRE SYSTEM
SOLVES HEATING PROBLEM FOR TIMKEN VOCATIONAL HIGH SCHOOL

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Timken Vocational fires three boilers with Canton Lo-Set Stokers. Each boiler is equipped with a Canton Turbo-aire smoke control system . . . individually activated by electric eyes watching density of smoke entering stack duct . . . that burns all smoke in the boilers. For firing coal automatically, economically and without smoke, investigate the complete Canton team . . . Stokers, Turbo-aire smoke control systems, Syncro combustion controls, Flo-tube screw conveyors . . . today.

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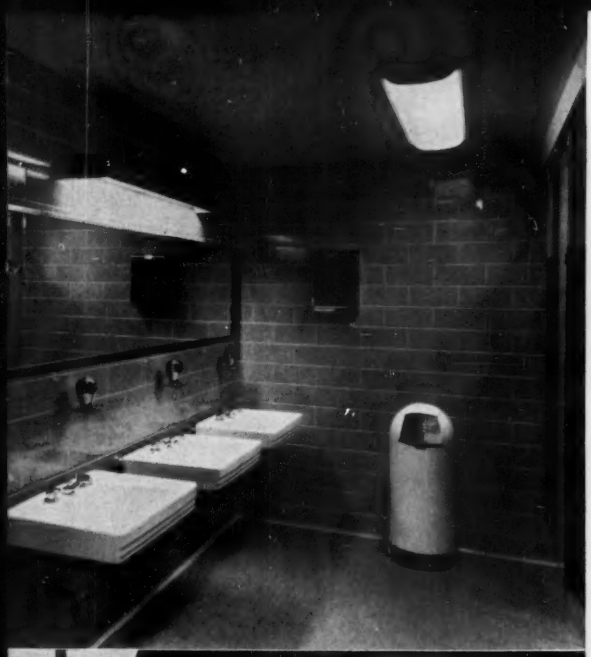
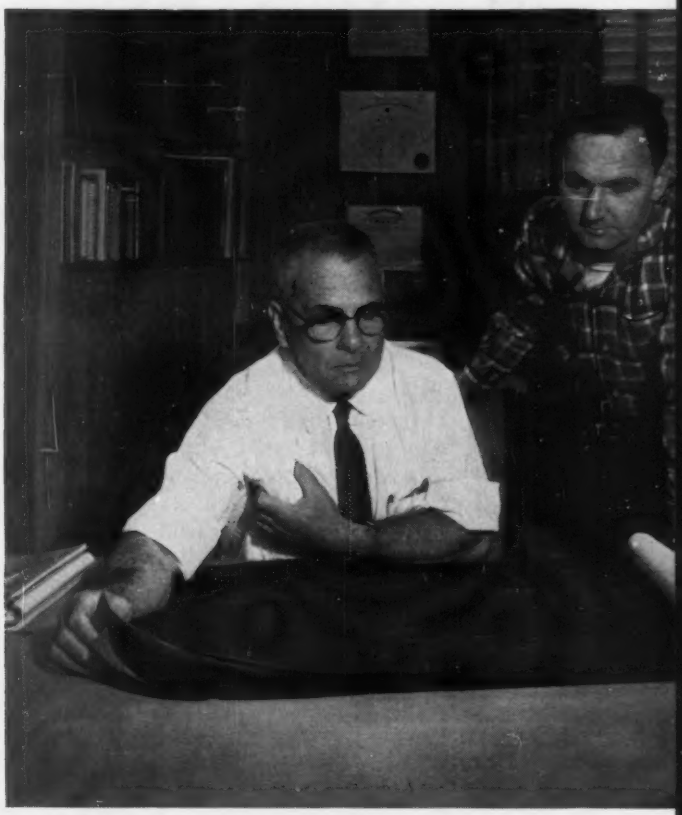
Mechanical planning and fixture installation were simplified, too, because Day-Brite equipment is designed for smooth integration with standard ceiling assemblies. Day-Brite *pioneered* and *introduced* today's widely accepted Ceiling Indexing System.

Most good architects, engineers and contractors think of Day-Brite *first* when lighting problems arise. Next time we can be of service to you, call your Day-Brite representative listed in the Yellow Pages.



DAY-BRITE . . . the Engineer's Choice



Consulting Engineer E. ROGER HEWITT (left) and WILLIAM TROMBLEY, Electrical Designer

How important is service?

Here's what Day-Brite service means to Roger Hewitt:

"Our fixture specifications are based upon a continuing analysis of all lighting fixtures. Design features, durability, assembly and installation procedures are carefully evaluated. Our specification requirements are rigid, but Day-Brite equipment never fails to meet them . . . and the price is right.

"As important as any of these requirements, however, is the service provided by the manufacturer. Here, too, Day-Brite is outstanding. On the Consumers Power Co. project, for example, a Day-Brite engineer came up to consult with us on the job, and was extremely helpful.

"I speak from experience when I say that the services performed by Day-Brite personnel—both at the factory and in the field—leave no cause for complaint."

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Z-440 ©Day-Brite Lighting, Inc. 1958

NATION'S LARGEST MANUFACTURER OF COMMERCIAL AND INDUSTRIAL LIGHTING EQUIPMENT

The Word From Washington

EDGAR A. POE
Consulting Engineer Correspondent

CONSULTING ENGINEERS should show a more active interest in the Jenkins-Keogh bill, which would permit self-employed persons, including sole owners and partners of engineering firms, to put aside up to $2500 a year in tax-deferred retirement funds. But many did nothing to help push the bill through the last session of Congress. With more backing from engineers, doctors, lawyers, and other self-employed people, it should have an excellent chance of being enacted during the next session. Interested engineers ought to write their representative and their two senators or, if possible, contact them in person before they return to Washington to start the new session January 7.

The bill permits self-employed persons to take a current tax deduction for a limited investment in certain types of retirement annuity or a specific type of retirement trust fund. The investment, plus accumulated earnings, would be treated as ordinary income when it is drawn on. This would be fairer to engineer-owners of unincorporated firms.

Deduction in general would be limited to 10 percent of net earnings from self-employment. Deductions under the bill could not, in most cases, exceed $2500 in any taxable year nor total more than $50,000 during a lifetime.

Ways and Means committee chairman Wilbur D. Mills and colleagues feel it is unreasonable that self-employed persons should be precluded by law from obtaining equivalent tax treatment on retirement income plans.

Tax Engineers

Something new in the way of "engineers" – the Internal Revenue Service says tax collection is an emerging field for engineers since many tax cases involve "engineering issues," such as various aspects of depreciation, depletion, valuation. A recent pamphlet points out that most taxpayers think of taxes in terms of blood, sweat, and tears, little realizing that engineer revenue agents are part of the team required to make the system work.

Federal Educational Aid

The new National Defense Education Act provides an additional $15 million a year for four years to expand the present vocational education assistance programs. According to the National Society of Professional Engineers, the legislative history behind the aid-to-education clause shows the intent is to use the money only to educate engineering and scientific technicians.

Congressional Notes

The McClellan committee, which turned up an amazing amount of racketeering among higher-ups in some labor unions, will continue inquiries through the first half of 1959 and maybe longer. Labor is building up pressure to have the investigations ended; however, Chairman John L. McClellan, Arkansas Democrat, says the committee has

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Redesigned annular passage increases centrifugal force. Separated moisture, oil and solids travel outer wall to lower collecting chamber. Large diameter, high level outlet reduces velocity, eliminates entrainment problems. Screwed ends ½" thru 3". 125 lbs. flanged ends 2½" thru 8". Low cost in-line installation.

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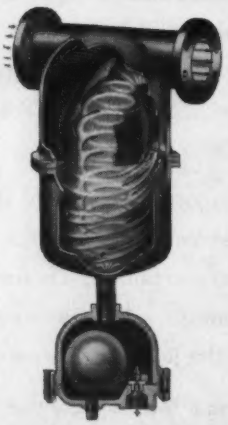

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Movement due to winds and temperature extremes pose a trying problem for designers of curtain wall buildings. The joint material must seal out water, dust and air but must remain flexible and resilient under these conditions. Hornflex, a thiokol formulation, provides a squeeze-stretch range of 325% and stays firm and elastic over a temperature range from *50°F BELOW ZERO to 250°F.*

Other uses for Hornflex are to fill and seal surface joints in bridges, highways, swimming pools, etc. Laboratory test and job applications indicate that Hornflex, properly installed, will provide excellent protection for periods up to *25 years and more.*

Like complete details? Write for Hornflex Technical Bulletin to Dept. H51-1229.

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ECONOMY makes these completely-automatic packaged units the ideal way to heat a wide variety of commercial and industrial buildings. Ask your Reznor distributor for the complete story or write for your free copy of "Modern Heating"

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UNIT HEATERS

Reznor Manufacturing Company, 78 Union Street, Mercer, Pa.

enough leads from union members to keep it busy three years. Despite the election returns, some feel there is an urgent need for amendments to the Taft-Hartley law to curb or stamp out secondary boycotts, blackmail picketing, compulsory unionism, embezzlement, and reckless spending of union pension and welfare funds.

The only labor legislation from Congress in 1958 was the welfare-pension control bill, requiring limited public disclosure of employee welfare and pension funds. But this measure may need more teeth in it, including penalties for unions filing false or inaccurate reports.

¶ The administration may recommend a higher Federal tax on gasoline and oil next year, for it appears the Highway Trust Fund will not have enough money to keep up the present construction pace unless Congress increases these taxes. Budget director Maurice Stan says if more revenues do not come from some source, the fund will show a deficit of $1 billion by mid-1960, and a $2-billion deficit by mid-1961.

Social Security Tax Hike

Effective January 1, social security taxes will increase to 2½ percent on the first $4800 of a worker's wage, compared with the present 2¼ percent on the first $4400. Social security tax on engineers and other self-employed individuals will increase correspondingly, for they will continue to pay 1.5 times the rate applicable to employees and employers.

Sea Water Research

Interior's Office of Saline Water plans to accelerate its research to find an easy inexpensive way to distill fresh water out of saline and brackish water. Congress approved $10 million for five new experimental plants, three for treatment of saline water. Conversion plants are already desalting sea water, but the cost is too high for commercial use. However, Interior secretary Fred A. Seaton feels the day is coming when conversion will cost only a few cents for 1000 gallons.

Meantime, pilot plant construction is progressing to check economic feasibility of various processes, including distillation through artificial heat; solar heat distillation; separation of salt by membrane processes of two or three kinds; freezing; and other chemical or electrical means.

The 49th State

Prime need for Alaska is an adequate highway system. Congress plans to step up road building next year, including a 1200-mile all-weather hard-surfaced highway connecting Alaska with the U.S. A link of the Alcan Highway, this road would be entirely in Canada. ▲▲

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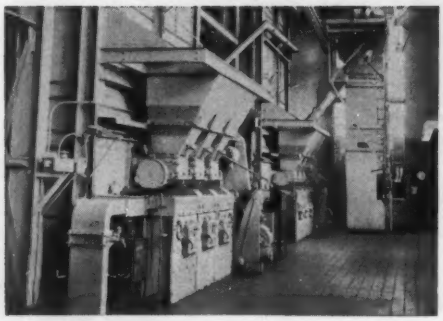
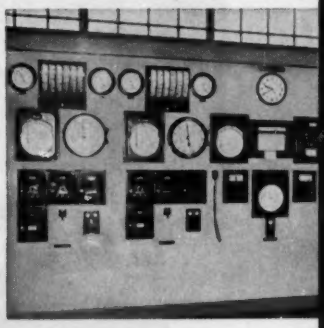


Firing aisle shows both Union Iron Works boilers . . . identical 2-drum, bent-tube type with a normal rating of 70,000 lb/hr. These units are fired by Detroit Rotograte Spreader Stokers.

Furnace ash and dust from Prat-Daniel Collectors are conveyed pneumatically to this 50-ton ash storage silo. Rotary dustless unloader assures a clean operation. Ash handling system is by United Conveyor Corp.



Combustion controls and instruments — centered in this control panel by Hays Corporation — regulate combustion and auxiliary operations automatically.

Coal scores with Notre Dame

University power plant burns coal for modern steam generation

Enrollment growth and building expansion had put a strain on the power plant at the University of Notre Dame, South Bend, Ind. After careful study—by the consulting firm of Albert Kahn Associated Architects and Engineers, of Detroit—a decision was made to modernize steam facilities and add power generating equipment. Two new coal-fired boilers, a turbo-generator and auxiliary equipment were installed.

Maximum efficiency is achieved through automatic combustion control and complete instrumentation. Today steam is generated *economically.* Another noteworthy result of these innovations has been the *cleanliness* of operation . . . making Notre Dame's power plant a model of good housekeeping.

Coal is lowest-cost fuel

Today, *when the annual cost of fuel often equals the original cost of the boilers,* you should know that bituminous coal is the lowest-cost fuel in most industrial areas. And modern coal-burning equipment gives you 15% to 50% *more* steam per dollar, while automatic operation trims labor costs and eliminates smoke problems. What's more, tremendous coal reserves and mechanized mining procedures assure you a constantly plentiful supply of coal at stable prices.

Technical advisory service

All companies planning a new power plant, or the remodeling of a present one, should consult an engineering firm on its design and construction. As a matter of fact, every Bituminous Coal Institute advertisement advises its readers to take this step. When you have such a project, our Engineering Staff will be glad to assist you in your fuel cost survey with any coal information you may require.

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Meanwhile, we believe you will be interested in our informative case histories booklet, complete with data sheets. Send coupon below for your copy.

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Exterior view of Notre Dame power plant. Careful planning of design combines spacious interior and pleasing exterior lines to maintain campus beauty.

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From the Editor's

Tranquil Tower

LAST MONTH in this column we gave considerable unsolicited advice to Consulting Engineers Council and its affiliated state and regional associations. This month, with perhaps even more presumption, we offer some advice relative to the running of NSPE and its State Societies.

Recently there has been a rash of functional group formation within these State Societies. Basically this is a good thing, for there is little doubt that some good can come from limiting participation in a discussion of problems peculiar to a particular group. Consulting engineers who are members of NSPE have logical reasons for discussing their special professional problems within their own small fraternity. If nothing more, this reduces the likelihood of boring other members of the society during lengthy discussions of agenda having no relation to the others' fields of activity.

There is a strong tendency, however, for functional groups to organize, not so much to serve their sector of the membership, as to counteract any movement toward the organization of associations of consulting engineers outside NSPE. Anyone who has attended many private practice functional group organization meetings is aware that there is seldom much offered in the way of a positive program. Instead, the new functional group is offered as a preventative measure designed to allay establishment of what the organizers refer to as a "splinter group."

As a result of this attitude, too many functional groups are devoting the majority of their efforts fighting a portion of their own membership that has felt the need for the establishment of separate associations designed to deal with the business aspects of private practice. Ohio is an excellent example. If the private practice functional group of the Ohio Society of Professional Engineers would spend more time and effort in promoting the professional well-being of its members and less time in-fighting with the 30-member Cincinnati Association of Consulting Engineers, the dues-paying members of OSPE would be getting more for their money.

But the Ohio Society is a lily-white innocent in comparison with the new Consulting Engineers' Section of the Kansas Engineering Society. Here, again, we have a group organized "to avoid a new splinter in the family of engineering societies." However, the organizers of this Kansas functional group showed that they had a better understanding of the true nature and purpose of the "splinter" associations in Consulting Engineers Council. They recognized that these associations were not designed to deal with professional problems of the individual engineer but were basically business associations representing consulting engineer firms. So, to compete, this Kansas Engineering Society functional section cast aside one of the basic tenets of NSPE philosophy, the principle of individual membership. In contrast, this Functional Section established an organization based on membership by firms, thereby setting itself up as a trade association. It even went so far as to set up a dues formula based on employee man-hours, a formula resembling that used by the Associated General Contractors. The assessments range from $100 for smallest firms to as much as $4000 annually for large organizations.

No one can criticize the work being done by this trade association within the Kansas Engineering Society. There is no doubt that Kansas consulting engineering firms need this type of organization. It is doing an excellent job for them. The real disaster is that NSPE would permit and that the Kansas Engineering Society would sponsor a trade association organized under their own constitutions; constitutions that expressly require individual membership and propose to promote the professional rather than the business interests of members.

The establishment of this principle of firm membership within functional groups would mean that in an Engineers in Industry Functional Group the "members" logically would be firms like Westinghouse, General Motors, or duPont. Members of an Educational Functional Group would be Cal. Tech., M.I.T., or Michigan State.

Is this the goal of NSPE? Or does it still hope to remain a society of individual, registered professional engineers and spend its time and money serving the professional needs of its members? ▲▲

New motor development obsoletes today's application practices!

Only from Allis-Chalmers!

Super-Seal motors save up to 60%

Here's an amazing advance in motor technology! It's the *Super-Seal* motor line—an open motor design so completely unaffected by moisture, dust, dirt, oil, acids and alkalies that it can be used in many applications previously requiring more costly enclosed motors. *Savings range from 15 to 60%.*

Super-Seal motor superiority results from two distinct revolutionary insulating techniques. Available in any integral horsepower size, smaller *Super-Seal* motors incorporate a *Poxeal* stator. A durable epoxy resin encloses the stator, creating an electrical system impervious to outside elements.

In larger sizes, *Silco-Flex* insulation is used. In this system, silicone rubber is vulcanized into a homogeneous mass to form a flexible, moisture and heat resistant, void-free dielectric barrier around coils and leads.

Both of these insulation systems are unsurpassed. Proof? An encapsulated motor ran for hundreds of hours at full load in a 4% brine solution.

Find out more by reading the next pages; then contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

ALLIS-CHALMERS

518 9100

Two revolutionary insulating techniques developed and pioneered by Allis-Chalmers mean savings of millions of dollars for motor users . . .

New open motors are unaffected by moisture and contaminants

Modern insulating materials and new methods of application, now available in *Super-Seal* open-type motors, are drastically changing motor application standards. These insulations are so completely impervious to moisture and contaminants that *Super-Seal* open motors can be used in most applications formerly requiring costly enclosed designs. Existing applications have resulted in savings as high as 60% .

Basic insulation systems

Larger *Super-Seal* motors with form-wound stator coils use the *Silco-Flex* insulation system. Heart of this system is a remarkable rubber-like silicone elastomer, applied in semi-cured state and vulcanized to form a void-free, impervious dielectric barrier. More than four years of development and field testing have proven the superior electrical and physical properties of *Silco-Flex* insulation systems.

Stator coils of smaller random-wound motors are protected by equally effective *Poxeal* insulation system. A tough, durable case of epoxy resin completely seals the winding end turns and slot portions. Bonded to the stator laminations, it forms a seal completely impervious to contaminants.

Moisture resistance

In addition to being void-free, the silicone elastomer used in *Silco-Flex* insulation is moisture repellent. Even in high humidity, moisture does not form a surface film of condensation. Coils with this protection can operate completely immersed in water. In fact, one of the recommended cleaning procedures is use of detergent and water.

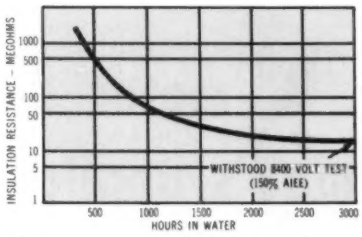


Fig. 1—Test curve shows insulation resistance of *Silco-Flex* insulation while immersed in water.

Moisture resistance of *Silco-Flex* coils is demonstrated in Fig. 1. After more than 3000 hours of total immersion with 2300 volts impressed on the coil, the test was terminated when it became apparent that little more drop could be expected in the coil's insulation resistance. At that point the coil still withstood a high potential test of 8400 volts without injury.

Encapsulated stator windings are equally well sealed. Motors with *Poxeal* insulation protection have been thoroughly tested under water while operating with full load and full voltage.

Resistance to contaminants

Silicone elastomers and epoxy resins are relatively inert to attack by practically all reactive agents. Further, the void-free construction of insulation systems used in *Super-Seal* motors prevents penetration of contaminants. As a result, *Super-Seal* motors are unaffected by oils, most acids, salt solutions, alkalies, and oils and are ideally suited for such applications.

Thermal stability

Temperature-wise, *Silco-Flex* insulation can easily withstand hot-spot temperatures of 200 C and more—

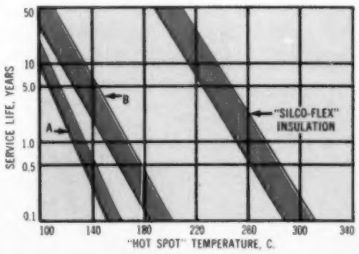


Fig. 2—Chart shows that *Silco-Flex* insulation more than meets Class H requirements.

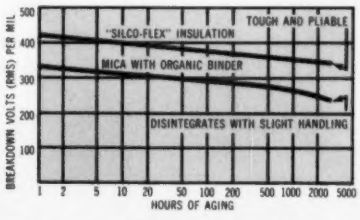
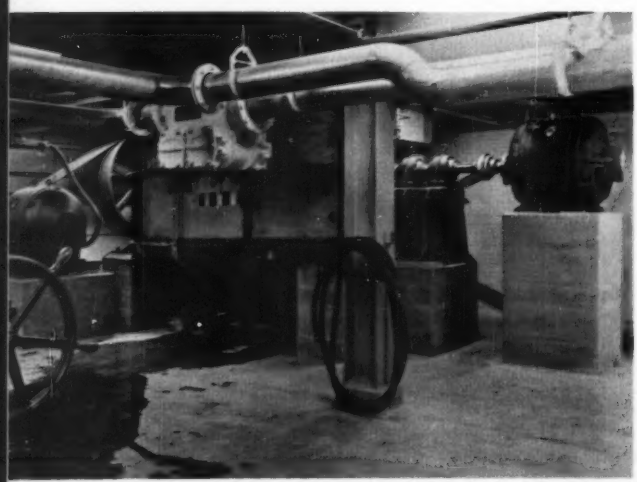


Fig. 3—Tests of 2300-volt insulated bars show thermal stability of *Silco-Flex* insulation.



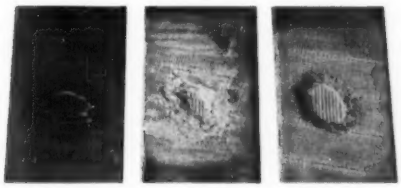
Paper mills have wide application for *Super-Seal* motors because of moist atmospheres.

easily meeting Class H temperature requirements (Fig. 2). At temperatures where the life of Class B coils would be measured in weeks, the life span of *Silco-Flex* coils is well beyond machine obsolescence.

Comparison with a mica-organic binder insulating system (Fig. 3) offers further proof of thermal stability. After 2000 hours of aging at 200 C with 8500 volts applied continuously, the *Silco-Flex* insulated coil was still tough, pliable, and completely serviceable. The mica-taped insulation had deteriorated to the point where it disintegrated readily and was completely useless.

An added advantage of *Silco-Flex* insulation is unusually high thermal conductivity — about twice that of conventional insulations. This means heat dissipates faster from its point of generation.

Poxeal insulation also demonstrates remarkably good thermal stability. Materials now in use are suitable for Class B temperatures, although actual classification of the insulation is determined by the basic material used.



Silco-Flex Insulation | Polyester Mica Tape | Asphaltum Mica Tape

Fig. 4—Samples of motor insulations after sandblasting give comparison of abrasion resistance.

Abrasion resistance

Resistance to abrasion is still another point of superiority in the insulation systems used for *Super-Seal* motors. Abrasion resistance of *Silco-Flex* insulation is compared to other types of insulation in Fig. 4. After one minute of sandblasting with 90-grit aluminum oxide and 100-psi air, only slight surface erosion appeared on the *Silco-Flex* sample. Other insulations were eroded to bare copper.

Application practices obsolete

The superior qualities of *Super-Seal* insulating systems, developed by Allis-Chalmers, make it necessary to reappraise present application practices. With virtually ageless insulation, *Super-Seal* motors assure more reliable service and require less upkeep than the best protected, conventionally insulated machines — and at considerably less cost.

Super-Seal, Poxeal, and Silco-Flex are Allis-Chalmers trademarks.

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WIDE ACCEPTANCE
of Super-Seal motors proves their advantages

Cement, petroleum, chemical, steel, mining, paper, utilities, municipalities and general industry — outstanding corporations in every field are specifying *Super-Seal* motors wherever operating conditions are tough.

Cost and *superior insulation* aren't the only reasons. Users are getting MORE MOTOR, too. Here's why:

Standard totally-enclosed motors, 55° C rise, have a *service factor of 1.* In other words, "nameplate" horsepower is the maximum. A 40° C rise *Super-Seal* motor with *Poxeal* insulation, and a 60° C rise *Super-Seal* motor with *Silco-Flex* insulation have a *service factor of 1.15.* For comparisons on what this difference means in required motor sizes, see this chart:

Rated Horsepower (Maximum Hp, TEFC)	Maximum Continuous Hp—*Super-Seal* Motor
15 hp	17.25 hp
25	28.75
40	46
75	86.25
125	143.75
200	230
350	402.5
500	575

Join the swing to *Super-Seal* motors. It will pay dividends fast. Contact your A-C representative or distributor, or write Allis-Chalmers at address shown on back page.

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This *SUPER-SEAL* MOTOR application SAVED $3000!

Find out how much you can save

This application of a *Super-Seal* open-type motor — in place of a weather-protected design of the same rating — *saved the user $3000.00!*

You can achieve similar savings! Fill out the data sheet below and *find out for yourself how much you can save — on a "no-strings-attached" basis.*

Here's what to do: 1) Select an enclosed motor application in your operations (a new motor need or, for comparison, a motor just purchased); 2) fill out the data sheet; 3) mail to the address shown.

We'll give you a cost quotation on a *Super-Seal* open motor for that application.

Fill out this data sheet—

no strings attached—to find out how much you can save on a new motor or on an existing motor installation

To: **ALLIS-CHALMERS**
888 S. 70th St., Milwaukee 1, Wis.

Motor Data

1. Type (i.e., squirrel cage):

Horizontal ☐ Vertical ☐

Hp..... Rpm.....

2. Phase..... Frequency.....

Voltage.....

3. (For synchronous only)

Power factor.....

Starting torque.....

Pull-in torque.....

Pull-out torque.....

Application Data

4. Description of application:

5. Drive: Direct-connected ☐
V-Belt ☐ Other:.....

Starting load.....

Ambient temperature.....

6. Operating conditions:.....

Dirty ☐ Clean ☐ Wet ☐ Dry ☐

Other.....

Information on Existing Motors
(for comparison)

7. Type of insulation

Type of enclosure

Time rating.....

Temperature rise.....

Bearings:
Anti-friction ☐ Sleeve ☐

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Report from the West Coast

RALPH S. TORGERSON
West Coast Editorial Representative

THE STRUCTURAL Engineers Association of California, organized "to promote the highest standards of structural engineering for the benefit of the client, the community, and the general public," held its annual meeting at Yosemite Valley recently.

Steel, Aluminum, Concrete

At the first technical session Professor T. Y. Lin, of the University of California, told about prestressed concrete structures in Russia. Director of the Prestressed Concrete Institute and a partner in the firm of T. Y. Lin and Associates, special consultants on prestressed concrete structures, Lin is the author of the book *Design of Prestressed Concrete Structures*, and over 30 technical papers and reports.

In May Lin headed an American delegation observing Soviet progress in concrete and prestressed concrete engineering in Russia. They found the Russians ahead of the U. S. in certain aspects of prestressed concrete design and construction and behind in others. The Russians use a greater volume of prestressed products in buildings, while we build many more prestressed bridges. Mass production of standard prestressed items seems to be the Russians' outstanding achievement, principally because of state-controlled planning, design standardization, and production mechanization. Soviet prestressed concrete developments so far seem to center on pretensioning; work in the field of post-tensioned products is just beginning. They use the continuous process of pretensioning almost exclusively.

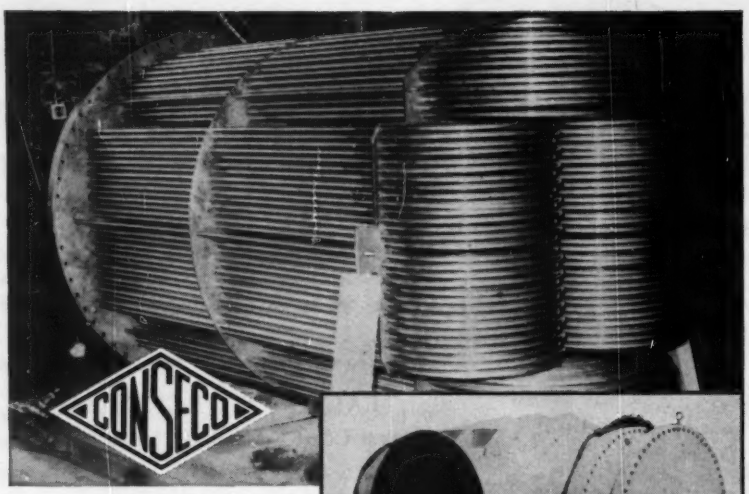
Harold J. Andrews, Alcoa development engineer, discussed factors confronting the structural designer in considering aluminum construction. The engineer can use standard aluminum structural shapes and plates in the design of members, or he may design specific extruded shapes to most efficiently locate the metal in a given cross-section.

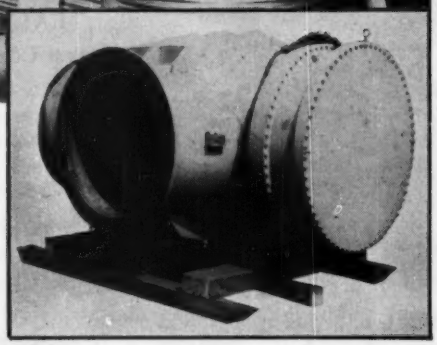
Doctor George Wastlund, professor of bridge building and structural engineering at the Royal Institute of Technology in Stockholm, vice president of the Swedish Association of Engineers and Architects, and technical adviser in the International Association for Bridge and Structural Engineering, described a number of high-strength steels used in Europe for concrete reinforcing bars. These steels have yield points in excess of 50,000 psi and allowable stresses ranging from 34,000 to 57,000 psi. In Sweden high-strength steels have largely superseded reinforcing bars made of ordinary mild steel.

American practice, Wastlund pointed out, has proved the possibility of using deformed bars and has demonstrated their advantages in dispensing with end hooks, in insuring better bond, and in reducing the size of cracks. European practice has gone farther by utilizing steels of higher strength, permitting high stresses, resulting in more economical designs. However, Wastlund warned, design requirements relating to limitation of crack formation or to limitation of deflections may make it impossible to fully utilize these higher permissible stresses. He discussed crack formation, deflections, failures of structures related to high-strength steel reinforcing bars, low-temperature sensitivity of high-strength steel, and construction problems arising from the difficulty of bending these high-strength steels.

Missiles

University of California mechanical engineering professor Edward V. Laitone showed why rockets are used for missile, satellite, and space ship launch-





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ings, and what was wrong with other launching devices proposed by science-fiction writers. Rockets used to launch Sputniks, Explorers, and Vanguard satellites were discussed. Because of complex launching and guidance problems Laitone believes the probability of a rocket to the moon in the near future is very small.

The supporting role of structural engineering in the missile field through the design of ground support equipment was discussed by A. L. Collin, chief development engineer for the fabricating division of Kaiser Steel Corporation. Collin mentioned difficulties in designing launching towers—some 15 stories high—because they must be movable. He listed four problem areas in missile facility design:

¶ Extremely tight time schedules coupled with numerous changes in design requirements

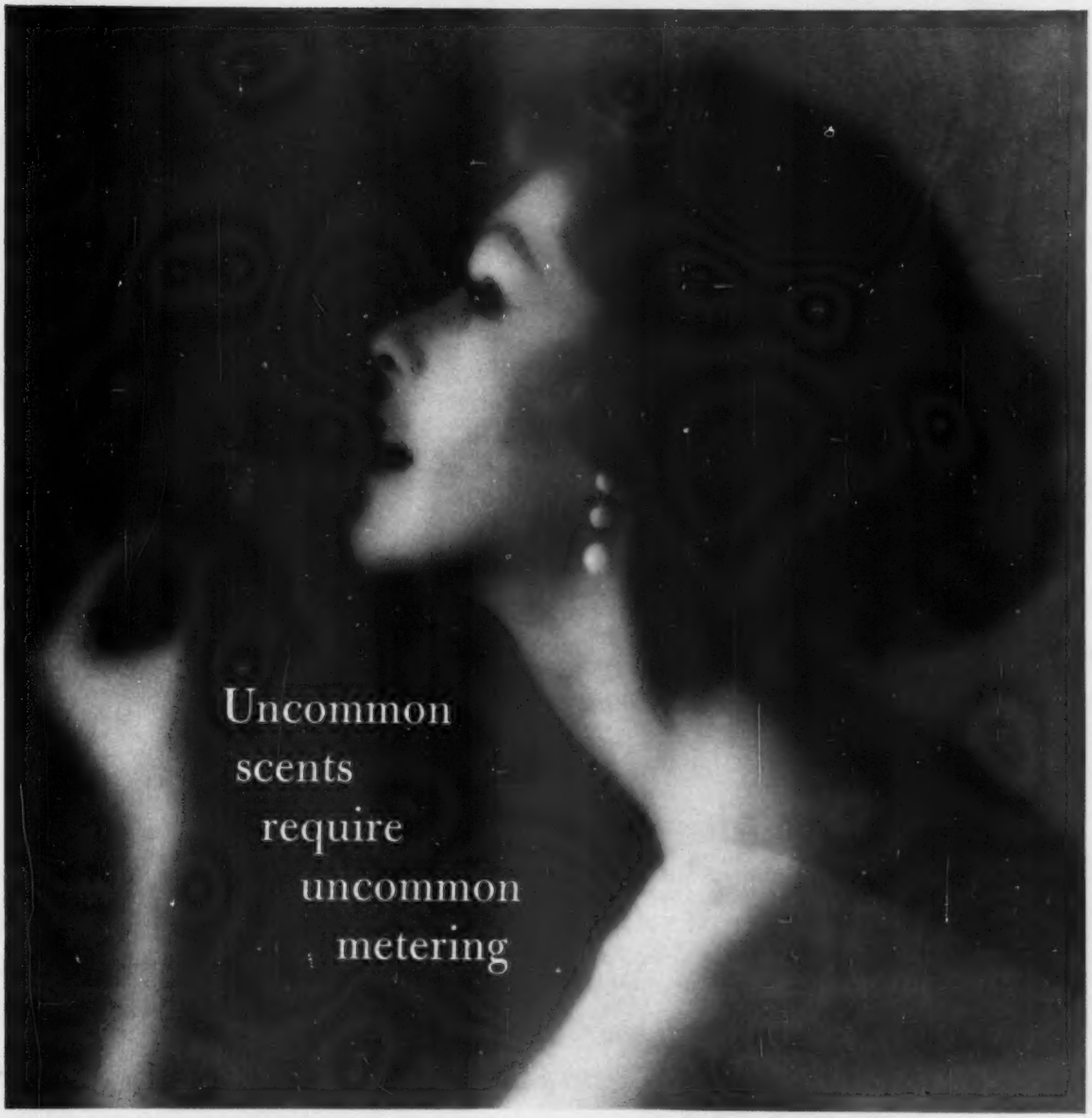
¶ Lack of design criteria and uncertainty about operating loads

¶ Confusion or disagreement about applicable specifications

¶ Confusion arising from the technical terminology of missile men.

Structural Steel

Henry J. Stetina, northeast area (Philadelphia) regional engineer of the American Institute of Steel Construction, said that up-to-date specifications and building codes recognize and permit five common types of connectors for joining structural steel elements: rivets, ribbed bolts, high-strength bolts, unfinished bolts, and welds. He discussed various specifications and code revisions for selecting fasteners, and covered the design considerations for the selection of a connector, including a tabulation of material and labor costs for installing a field fastener, including welds. Rating presently recognized connectors by design and economy, Stetina said the first choice for shop fasteners would be rivets or weld, with unfinished bolts second, and high-strength bolts and ribbed bolts third. For field con-



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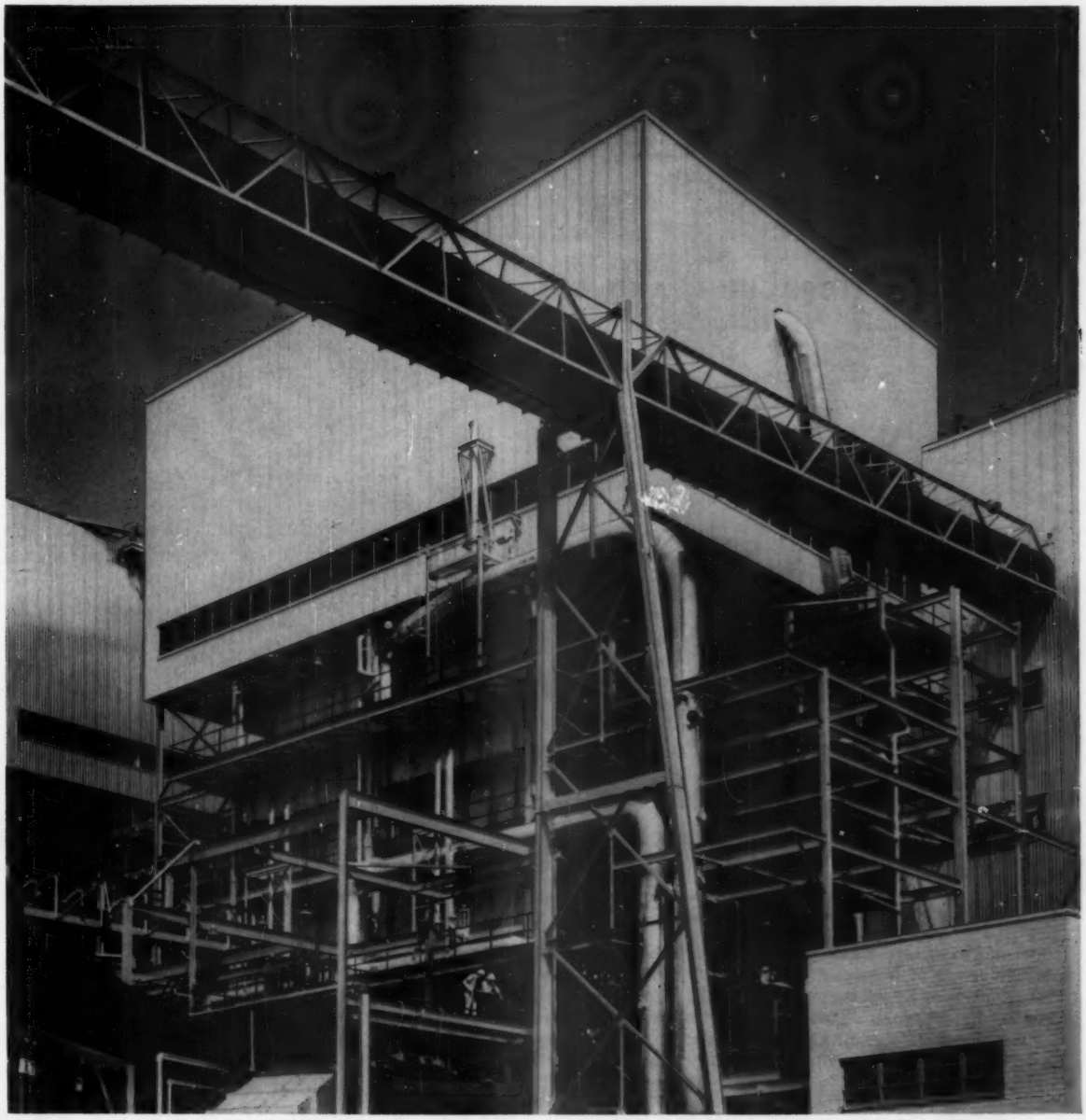
nections, first choice would be unfinished bolts, high-strength bolts, or weld, with the rivet a poor second, and the ribbed bolt third.

Until recently, said M. H. Frincke, manager of erection for Bethlehem Pacific Coast Steel Corporation, the most satisfactory method of tensioning high-strength bolts was with a calibrated impact wrench operated by controlled air pressure. This controlled the tension in the bolt by controlling the torque applied to the nut. But the calibrated wrench can be used only on bolts with the diameter for which it is calibrated. Modern building construction uses as many as four or five different diameters of bolts at a given joint.

Consequently, a different measure of torsion, other than torque, is needed. The turn-of-the-nut method controls the tension in the bolt by controlling its elongation. Numerous tests have shown that starting with the connection properly fit-up and with the nuts in a snug position, a half to three-quarter turn of the nut will tension the bolt more than the minimum required by specifications. The turn-of-the-nut method eliminates daily calibration of impact wrenches for different-size bolts and gives more consistent results with less-skilled operators than previous methods.

Composite Concrete Application

Alfred A. Yee, vice president of Park and Yee, Ltd., Honolulu consulting engineers and, in collaboration with K. D. Park, designer of the first thin shell concrete structure built in the Hawaiian Islands, described the use of prestressed concrete in the present Honolulu building construction program. Limiting his discussion to the composite-type deck-framing systems now under construction or planned for construction, Yee said that precast prestressed concrete elements can be combined with poured-in-place concrete so the advantages of each material are realized. First



Power Company buys aluminum's long-range economy

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West Penn Power used Alcoa® Aluminum extensively throughout its new Armstrong Station. Because, with aluminum, *first costs are last costs.* There's no costly painting or maintenance . . . no need to worry about corrosion damage. Aluminum stays on the job year after year, defying fumes, grit and the worst kinds of weather.

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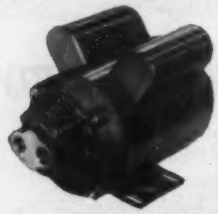

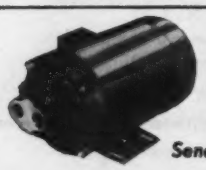

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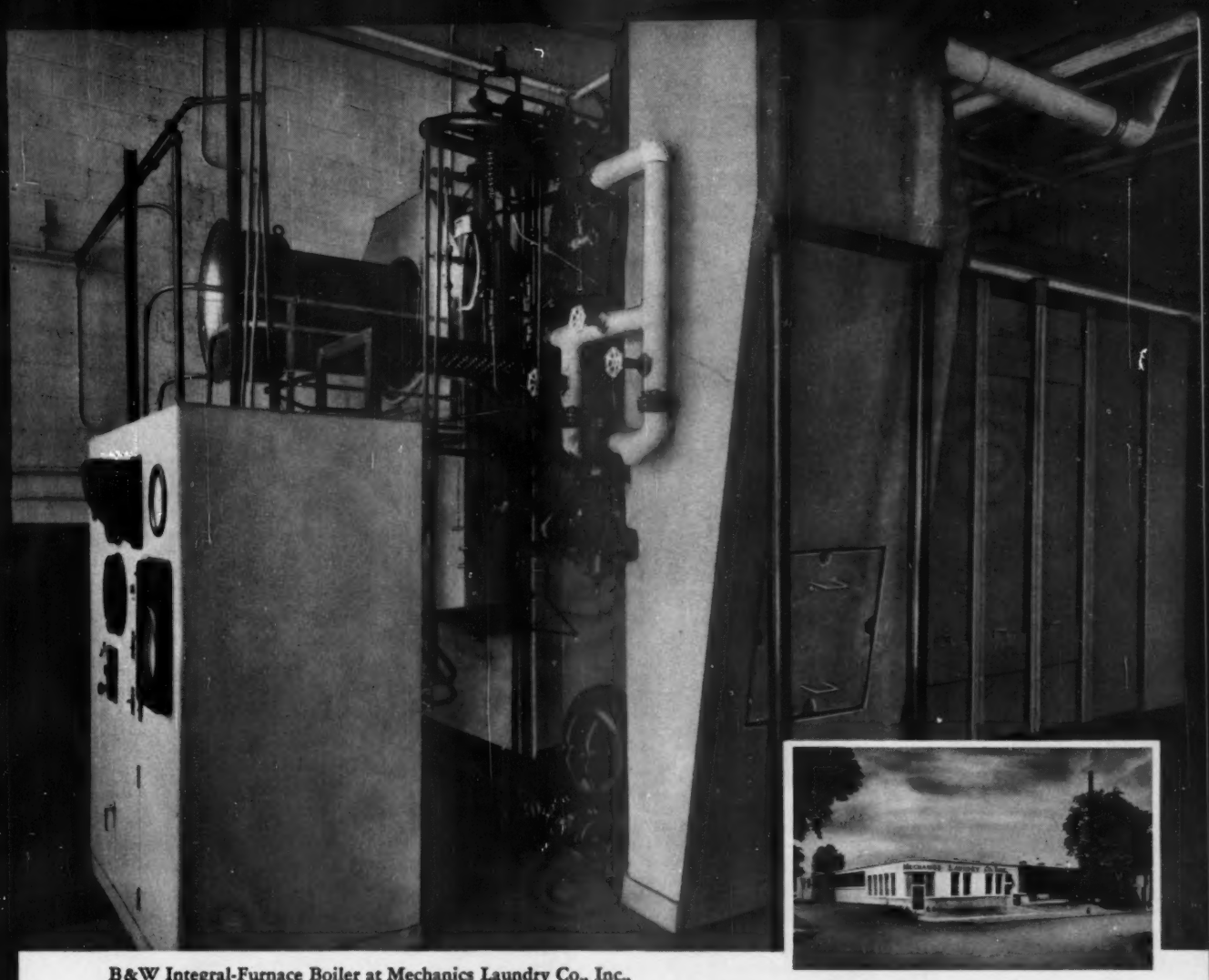
a skeleton made up of prestressed concrete units is assembled at the site. Structural concrete then is poured and placed to join these units together and produce a new composite frame sufficiently strong to resist design loads.

Prestressed skeletons can be made with units of various shapes, each suited for engineering, mass production, construction economy, architecture, and other influences. At present the most popular prestressed unit is an unbalanced I-joist with the bottom flange somewhat larger than the top flange. These joists may be spaced at different intervals to suit engineering or architectural requirements. Formed panels for the poured and placed floor are supported on 2 x 4s resting on the bottom flange of the I. The poured-in-place concrete provides an integral part of the deck strength through composite action, and ties together all the prestressed units.

Other systems use prestressed concrete planks as flat floor slabs with poured-in-place slabs on top, or as the bottom forms of a composite pan-joist type of construction. Yee compared material and labor costs of installing these various deck systems with conventional reinforced concrete flat slab construction and with conventional reinforced concrete pan joist construction, showing sizable advantages favoring composite construction, particularly on long spans.

Earthquake Code

William T. Wheeler, a partner in Wheeler and Gray, Los Angeles structural engineers, and chairman of the SEAOC seismology committee, reviewed the recommendations of the committee for a proposed lateral force code to reconcile conflicting opinions of structural engineers from northern and southern California. The recommendations are in the same form as the present uniform building code lateral force provisions. Plans are to submit these recommendations to the



B&W Integral-Furnace Boiler at Mechanics Laundry Co., Inc., Rochester, N. Y., has a capacity of 20,500 lb of steam per hr at operating pressure of 125 psi and design pressure of 250 psi.

B&W INTEGRAL FURNACE BOILER SAVES LAUNDRY $4,000 A YEAR

Cuts Maintenance 90%, Fuel 15% While Meeting Wide Load Swings

Mechanics Laundry Co., Inc., of Rochester, N. Y., is saving an estimated $4,000 a year with its new B&W Integral-Furnace Boiler. The oil-burning unit replaced two old units and has given more steam at higher efficiency in one-half the former space.

Fluctuating Load demand of the industrial laundry ranges from 8,000 to 20,000 lb of steam per hr, several times a day. The B&W unit has met these wide load swings promptly and easily.

Fuel Savings alone amount to $200 a month. Maintenance has been reduced to practically nothing. The unit's response to load swings, its compact design, and operating efficiency are notable.

Continuity of Service and overall economy have been proved for B&W Integral-Furnace Boilers in hundreds of installations. They provide maximum capacity in small boiler room space, high availability, and smokeless combustion. Supported by a national network of plants and engineers, they are designed and engineered from a background of nearly a century of steam generating experience. The Babcock & Wilcox Company, Boiler Division, 161 East 42nd Street, New York 17, N. Y.

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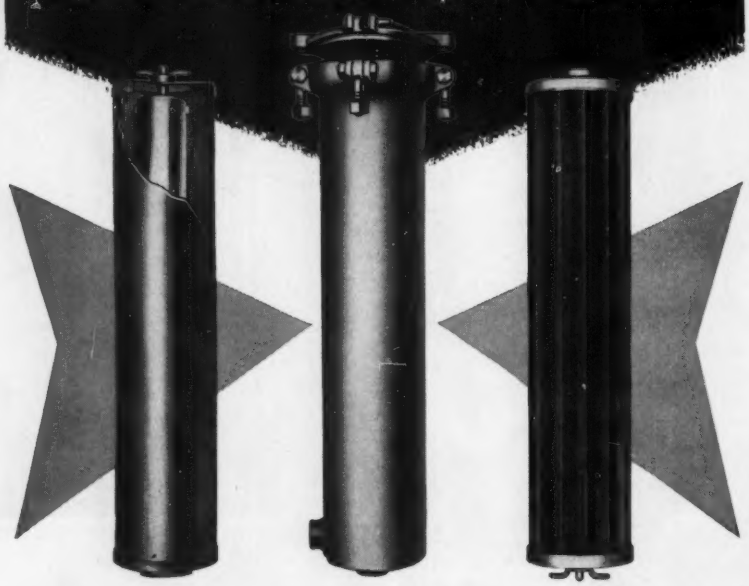

Figure 1554A-4L strainer basket available in brass, steel or stainless steel screen. 8 x 8 to 100 x 100 mesh.

Figure 1554-4L and Figure 1490DD-4L strainer shells are identical. Strainer baskets shown are interchangeable in this model.

Figure 1490CN-4L basket. Star-shape provides 20% more free screen area in this size. Available same metals, mesh as Fig. 1554A.

Nugent pipe line strainers can materially reduce your maintenance labor costs and hold down-time to a minimum. Unlike most strainers of this type, both the Nugent round basket and star-shaped extended area strainers, shown above, catch and hold their accumulation of foreign solids in the interior of the strainer basket.

Dirty liquid, under pressure, enters the strainer through the bottom inlet. It is then propelled upward through the center tube assembly. Emerging at the top, the liquid travels outward and downward, through the mesh of the basket and to the side outlet. In this manner, foreign solids are trapped *inside* the strainer basket which is then easily lifted from the outer shell for cleaning. A clean spare basket may be immediately substituted and the dirty basket cleaned when convenient.

Most other strainers direct the flow of dirty liquid from the exterior to the interior of the basket. Thus, foreign matter is trapped between the outer shell and the basket; not inside. When these dirty baskets are removed for cleaning, it is almost impossible to prevent some foreign matter from flowing back to the inlet and outlet piping. This type also requires scraping and cleaning the interior of the outer shell, a time consuming task that increases down-time.

Nugent strainers can save you time and money. For full details write for Bulletin 6.

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International Building Officials Conference for approval and adoption in the next issue of the Uniform Building Code. Their recommended formula for determining minimum total lateral seismic force acting on the structure includes a factor which recognizes the influence of the type or arrangement of lateral resisting elements in the structure.

Other Business

President Henry J. Degenkolb reported on the final steps for incorporating the association.

Joseph Sheffet presented a resolution adopted by the association's board of directors calling on the State Board of Registration to pursue a more aggressive attitude toward violations of the code, and asking that injunctive proceedings be used to curb violations.

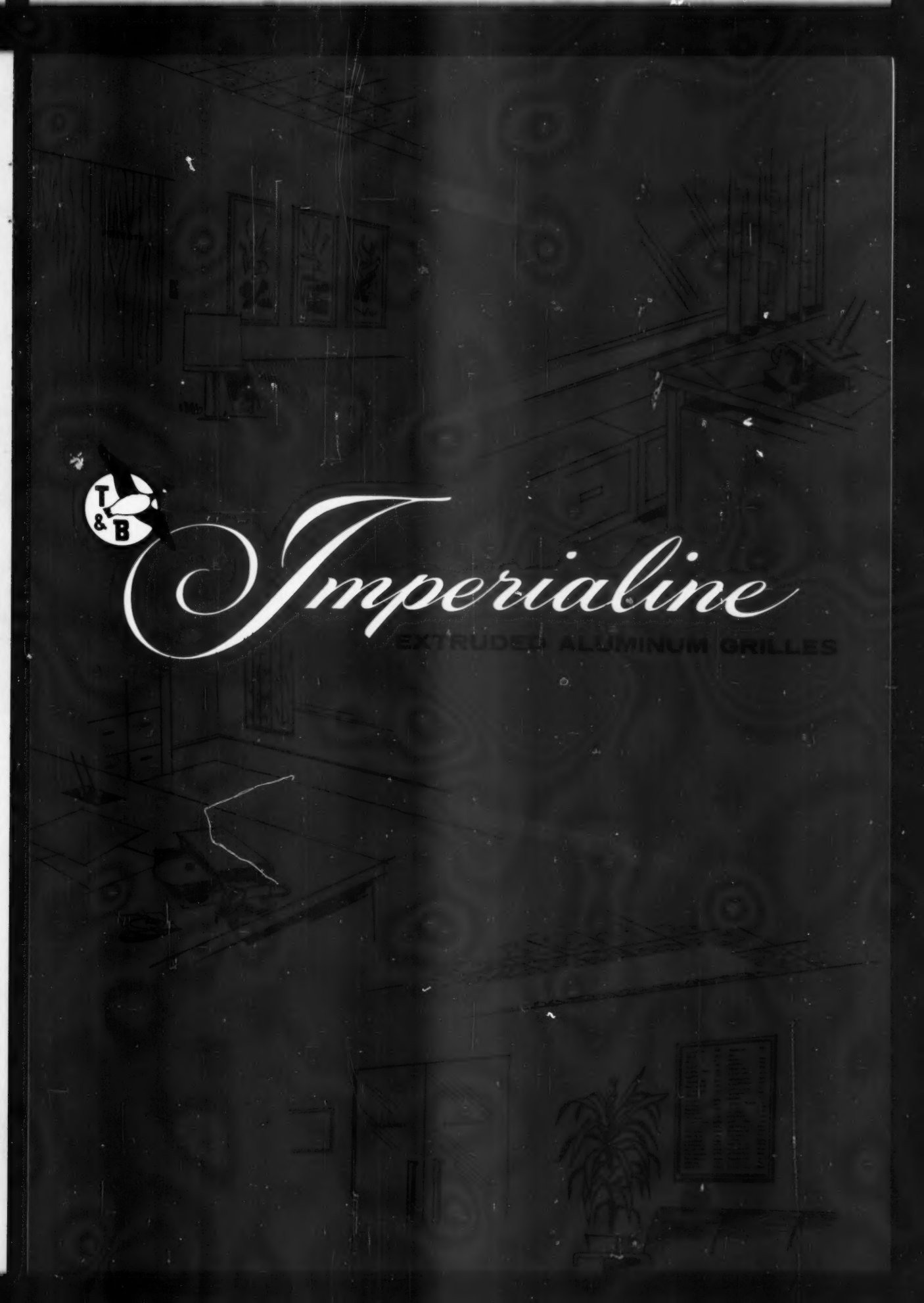
Officers and directors of SEAOC for the coming year are: Joseph Sheffet, president; J. Albert Paquette, vice president; W. A. Jensen, secretary-treasurer; directors, R. W. Binder, B. M. Wilson, C. M. Herd, H. F. Finch, H. J. Degenkolb, J. M. Sardis, and H. S. Kellam.

Form National Council

The SEAOC joint steering committee met with representatives of structural engineers associations of Arizona, Oregon, and Washington to form a national organization.

The name "Structural Engineers Associations—National Council" was adopted for the proposed organization. Committee members feel the proposed Council can be active in building code matters, registration of engineers, and other interstate engineering problems.

Present were: C. M. Herd (California) chairman, joint steering committee; H. A. Schirmer (northern California); T. R. Soderberg (Arizona); J. G. Lodge (Washington); E. E. Gunnette (Washington); C. H. Woodworth (Oregon); A. M. James (Oregon); J. P. Esvelt (Washington); and C. M. Barr (Seattle chapter). ▲▲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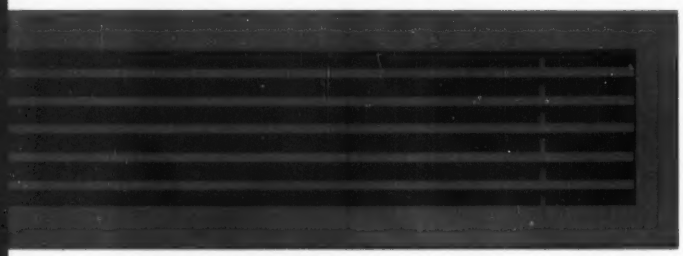

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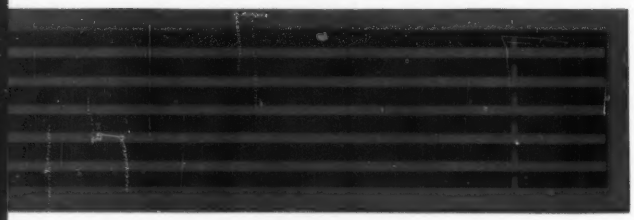
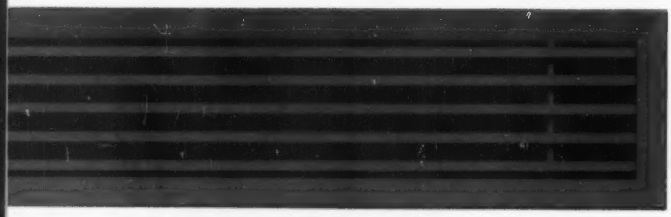
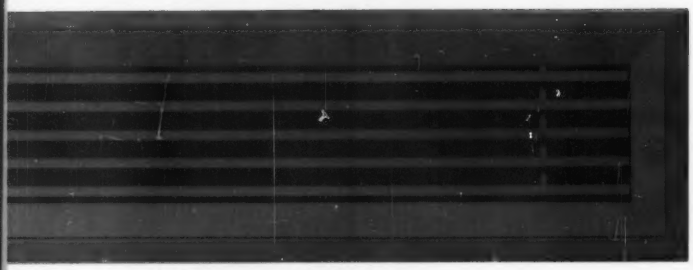


⅜" FLAT MARGIN (FLUSH)



½" BEVELED MARGIN (FLUSH)



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Atoms in Action

JOHN F. LEE

Broughton Professor of Mechanical Engineering
North Carolina State College

Geneva Atomic Energy Conference -- 1958

ALTHOUGH THE Geneva Conference on the Peaceful Uses of Atomic Energy is no longer today's news, its impact will be felt for a long time. So much scientific material was presented at this conference that it was impossible to give it the analysis it deserved in the face of a clamor for the highlights. For example, much can be learned from an analysis of the material presented on nuclear power reactors, fuel cycles, and nuclear fuels.

Experience with Power Reactors

Three large-scale nuclear power stations are in operation. These include a gas-cooled graphite moderated reactor at Calder Hall, England; the pressurized-water reactor at Shippingport, Pennsylvania; and another pressurized-water reactor in Siberia. Although these plants are generatng power under conditions imposed on any central station, there is an essential difference in the fact that the nuclear plants were built to demonstrate or investigate several technical points. None was expected to prove economical but to point the way to eventual nuclear power. All were intended to afford experience in operating characteristics, safety measures, and maintenance requirements and to discover technical improvements. Looming over all these purposes was a desire to see if the particular type of reactor selected for the power plant represented the proper vehicle for achieving economical nuclear power.

Experience thus far reveals that all the nuclear power plants operate both safely and in a predictable fashion. Shutdowns for the purpose of repairing defects have been few and of a very short duration. Surprisingly enough, most of the defects requiring shutdowns have developed in the conventional components of the power plants.

It was expected that the fuel elements would be a source of difficulty. The elements are sheathed in stainless steel to prevent corrosion of the fissionable material. The integrity of the sheathing is crucial since leakage of radioactive fission products into the coolant would contaminate all components. The warning systems for detecting defective fuel elements have been completely reliable. Shutdowns for defective fuel elements have been rare. Operating experience in these demonstration power plants turned up only three or four failures per year per ten thousand fuel elements. This is an impressive record if one compares it with tube-failure experience with the early conventional steam generators.

Four Types

The full-scale nuclear power plants now include four principal types. The graphite-moderated gas-cooled reactor and the pressurized-water reactor have been carried over into the second generation. Two new types emerge—the boiling-water reactor and the heavy-water-moderated reactor. There has been a significant decrease in the capital costs of the second-generation nuclear power plants below the costs of the first-generation plants. Nevertheless, capital costs of nuclear power are still more than twice those of conventional plants of comparable capacity. Based on experience with the first-gener-

ation and second-generation nuclear power plants there is every reason to believe that capital costs will decrease markedly during the next 10 years.

Experience with the pressurized-water reactor shows definitely that we have grossly underestimated its capability. This underestimation has been so severe that the capital costs (per kilowatt) of pressurized-water nuclear power plants could very well be as much as 40 percent lower than original estimates. Conservatism in the design of nuclear power plants in the first two generations indicate that capital costs (per kilowatt) are at least 20 percent higher than they need be. It appears reasonable that technological developments coupled with more realistic estimates of capacity could bring about a reduction of about 30 percent in capital costs in the relatively near future for nuclear power plants.

Five years ago I predicted that the boiling-water reactor represented the most sensible approach to economic nuclear power. At that time there was considerable uncertainty about the stability of this type of reactor. It is gratifying to note that subsequent experiment has revealed that the boiling-water reactor is indeed stable and, in fact, exhibits many characteristics agreeable to the system behavior of a power plant. Performance is very reliable. Low system pressure, small size, and simplicity still make the boiling-water reactor the most promising from the standpoint of low capital cost.

Fuel Costs

The first-generation nuclear power plants were planned without any clear knowledge of the true open market value of nuclear fuels. We are now in a better position to take realistic account of the effect of nuclear fuel costs on the over-all cost of producing power. Depending on whether natural (or near-natural) uranium or highly enriched fuel is used, the fuel costs will range from 20 percent to 40 percent of the total cost of producing power. Of course the type of nuclear fuel used governs to a large extent the kind of reactor selected. Based on fuel considerations, the graphite-moderated and heavy-water-moderated reactors incur the lowest fuel costs.

Experience reports at Geneva show that the fuel costs for a gas-cooled graphite-moderated reactor amount to about 2 mills per kilowatt-hour of electricity. The corresponding figures for heavy-water-moderated and light-water-moderated reactors are 3 mills and 1 mill, respectively. These figures should be compared with conventional fuel costs ranging from 3.3 mills in low-fuel-cost areas of the United States to 8 mills in some European countries. Thus it is seen, contrary to popular

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central sound system

For program distribution and announcements to all rooms or any selection of rooms. DuKane has installed more school sound systems than any other manufacturer! DuKane systems are custom-installed from mass-produced components, engineered to suit the requirements of any school, regardless of size.

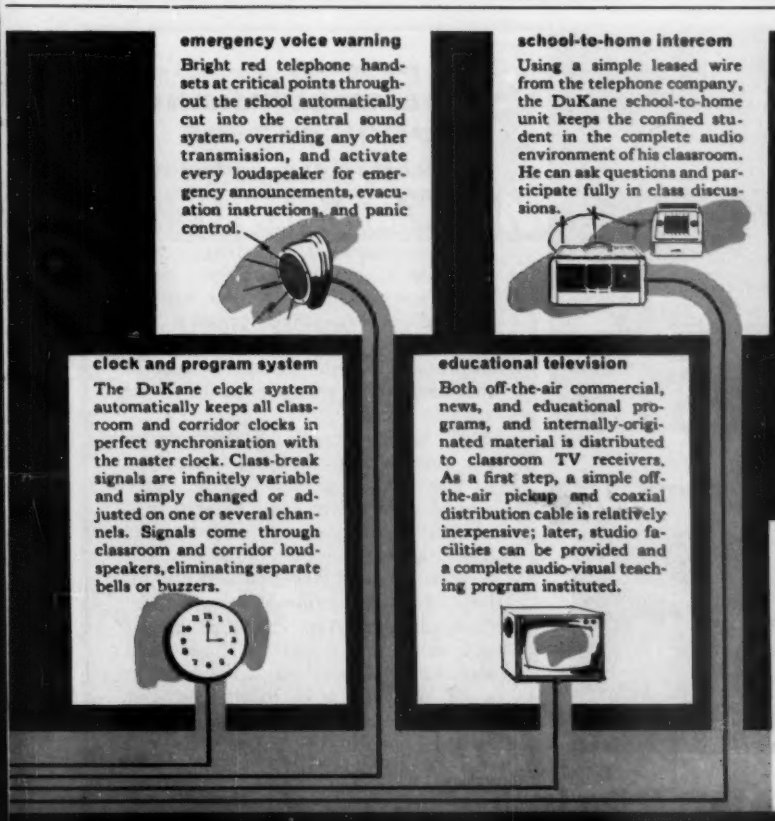
opinion, that nuclear fuels do not offer such a marked cost advantage in many parts of the United States and that the advantage is not sufficiently great in most parts of the world to eradicate the effect of higher capital costs.

Just as for conventional power plants, the overall charges for electricity generated in nuclear power plants depend on capital costs, load factor, and fuel costs in a particular country or region. Lower labor costs in fabrication, erection, and construction in a particular country may very well be offset by higher equipment charges, particularly if the components must be imported. In any event, what is compared is the capital cost of a nuclear power plant and that of a conventional power plant in a particular locality. This comparison may have no meaning in another area. Furthermore in an area where conventional-fuel costs are high, it is clear that there is considerably more latitude in achieving parity with conventional power from a standpoint of costs.

Still another consideration is the load factor. It is clear that the fixed-charge element in power production is lower for a plant operating as a base-load station with a load factor of 100 compared with the same plant operating with a load factor of 75. Now, the United Kingdom has shown that a 500-megawatt nuclear power plant to be completed in England, in 1962, will achieve parity with conventional power plants in areas of England far removed from the coal fields.

What significance does this fact have for the United States? In the first place Britain has the advantage of lower labor costs and yet it does not need to import any components. As a result, capital costs are lower in Britain than in the United States for the same nuclear power plant. The cost of conventional fuels in many parts of England easily exceed twice the figure in many parts of the United States. On the other hand, the British figures are based on a conservative load factor of 75. As a matter of fact, in my opinion, the British plants probably will operate at higher load factors, nuclear fuel prices will decrease, and the fuel burn-up will increase—all of which means that the predicted costs may fall somewhat below those of conventional power plants in Britain. But this has no absolute meaning for the United States except in the light of a trend.

An extreme example is that of the 150-megawatt nuclear power station being built in India. This plant is expected to achieve parity almost immediately. One thing is clear from all experience and that is the fact that the total costs of producing electricity in nuclear power plants is experiencing a downward trend. Barring a major breakthrough


emergency voice warning
Bright red telephone handsets at critical points throughout the school automatically cut into the central sound system, overriding any other transmission, and activate every loudspeaker for emergency announcements, evacuation instructions, and panic control.
school-to-home intercom
Using a simple leased wire from the telephone company, the DuKane school-to-home unit keeps the confined student in the complete audio environment of his classroom. He can ask questions and participate fully in class discussions.
clock and program system
The DuKane clock system automatically keeps all classroom and corridor clocks in perfect synchronization with the master clock. Class-break signals are infinitely variable and simply changed or adjusted on one or several channels. Signals come through classroom and corridor loudspeakers, eliminating separate bells or buzzers.
educational television
Both off-the-air commercial, news, and educational programs, and internally-originated material is distributed to classroom TV receivers. As a first step, a simple off-the-air pickup and coaxial distribution cable is relatively inexpensive; later, studio facilities can be provided and a complete audio-visual teaching program instituted.

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each country occupies a position on this trend curve where, depending on its own peculiar circumstances, parity between conventional and nuclear power is achieved. All evidence indicates that the position of the United States on this trend curve predicts 1973 as the earliest date for the achievement of parity. There was almost complete general agreement that most new power plants built anywhere in the world after 1975 will be nuclear power plants.

Advanced Types of Reactors

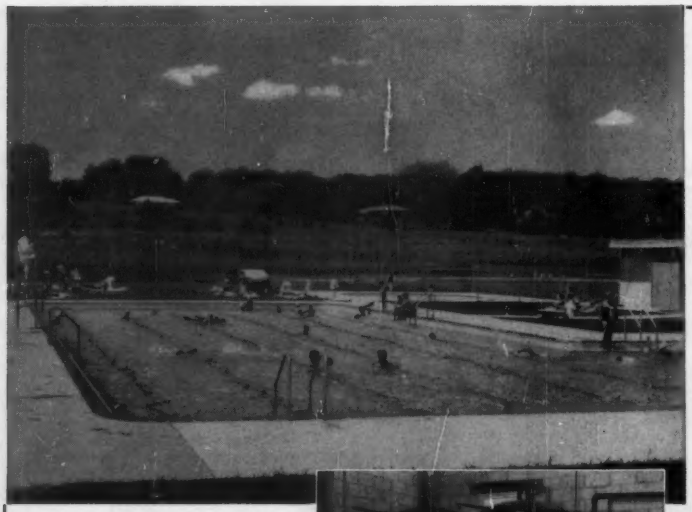
The character of the third generation of nuclear power plants is beginning to emerge from the prototype studies now being undertaken. Some of these stations will be coming into operation by the late 1960s. The results of experience gained from the various reactor experiments are encouraging. One type of advanced power reactor is organic-liquid moderated and can operate at low system pressure. The organic moderator and coolant is noncorrosive and nonradioactive. Obvious advantages of these characteristics are lower costs and simpler operation. One previously unknown factor was the cost of replacing the organic moderator, which eventually breaks down under radiation. This cost now is established at 1 mill per kilowatt-hour of electricity.

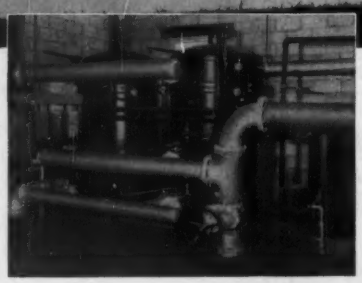
There has been good progress in experiments on the aqueous homogenous reactor although the compatability problems are not entirely solved and the stability of the fluid fuel remains as a stubborn problem. The sodium-graphite reactor experiments continue to reveal important information on high-temperature metallic fuel elements and sodium technology. An important advanced reactor is the high-temperature gas-cooled reactor utilizing all-ceramic fuel elements. This type of reactor is especially promising for propulsion systems. Britain is taking the lead in developing this type of reactor with the collaboration of several European nations.

Fuel Cycles

An important consideration in the development of nuclear power technology is the type of fuel to be used and its processing. The trend is clearly in the direction of uranium oxide fuels enriched with U-235, enrichment ranging from 1 to 3 percent. Graphite-moderated reactors will require a lower percentage of enrichment, with light-water-moderated reactors requiring the larger percentages.

The question which now arises has to do with the source of enrichment. Countries such as the United States and Britain, which have diffusion plants, possess a source of U-235 for enrichment. Another source of enriching material is the plu-





Shown above is the beautiful Oxon Hill Country Club Pool, Oxon Hill, Maryland which uses an Adams 1-SPF-169 filter to handle the almost 200,000 gallons capacity. Ted Messenger and Associates, Washington, D.C., were the consultants.

Adams SPF swimming pool filters are available in sizes from 53 to more than 1000 square feet of filter area. Normally all sizes can be shipped from stock. A typical unit is shown at the right.

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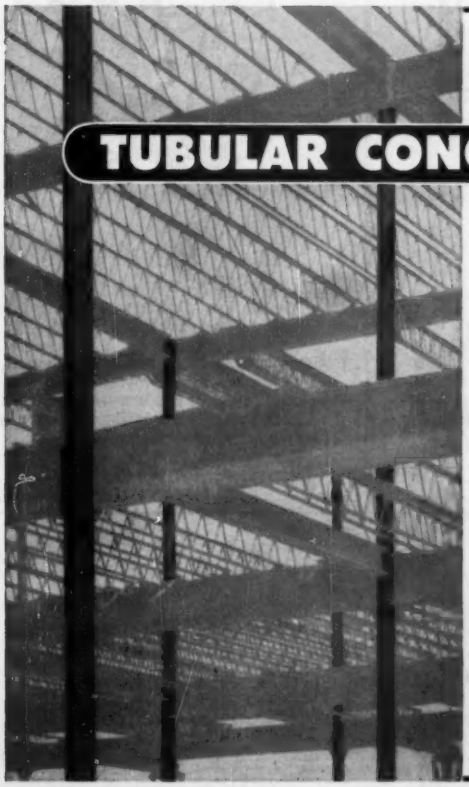
tonium produced in earlier reactors. Once the initial charge is provided, the reactor can operate on natural uranium, or slightly enriched uranium, by recycling plutonium in the form of an oxide mixed with uranium oxide. Recycling is not a simple matter, particularly with respect to the poisoning effect on the fuel produced by an accumulation of higher isotopes such as plutonium-242. Reported technological developments in this area are encouraging.

Although uranium is in abundant supply, it is not inexhaustible. I feel that a more responsible attitude toward this valuable natural resource would dictate careful attention to the development of fast breeder reactors and the extended use of thorium cycles. The fast breeder can produce more plutonium (in terms of energy) than the uranium it consumes (in terms of mass). The result is a net gain which achieves a better utilization of our uranium resources. The use of thorium cycles, even though a relatively large investment in U-235 or plutonium is required to initiate the cycle, would provide a more balanced utilization of available nuclear fuels. The short-term gains resulting from immediate exploitation of our uranium reserves has much less justification in the United States (in view of our position on the trend curve) than in some of the high-cost-energy areas of the world.

Nuclear Fuel Supplies

One can derive a great deal of comfort from the figures revealed on the world reserves of nuclear fuels. Based on current production costs we can expect at least 40,000 tons of uranium oxide per year at prices ranging from $8 to $10 per pound. The proved reserves in the United States, Canada, France and South Africa consist of 2-million tons. Experience from the last 10 years and present geological data indicate an additional 2-million tons of unproved reserves. Guessing at the reserves in Russia, China, and other countries it is likely that the world reserves of high-grade uranium ores are of the magnitude of 10-million tons. Low-grade ores in shales and phosphates appear to be limitless. Furthermore, important deposits of thorium have been found in India and Canada. The world reserves of thorium are conservatively estimated at 500,000 tons.

Based on energy represented the world reserves of nuclear fuels are more than three times estimated coal reserves. Since it is likely we shall have fusion power long before our reserves of nuclear fuels are used up the question of conservation may appear to be unwarranted, but who can tell today what other use for these resources may some day dwarf their importance as fuels? Perhaps they are too precious to be expended merely as fuel. ▲▲



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MOLDED CASE CIRCUIT BREAKERS

WHY A MOLDED CASE CIRCUIT BREAKER?

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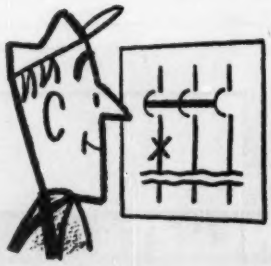
Completely enclosed terminals on I-T-E Molded Case Circuit Breakers provide maximum safety to personnel, even when breaker enclosure covers are open. And I-T-E Circuit Breakers cannot be manually held closed against a short, because they open instantly.

5. NO REPLACEMENT OR MAINTENANCE COSTS

Circuit breakers do not require replacement parts or fuses—the first cost is the last. Nor do they require periodic checkup and maintenance, such as tightening of joints, cleaning of contacts, and occasional tightening of removable fuse links.



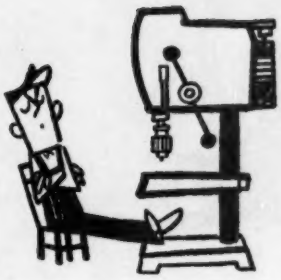
6. PREVENTS SINGLE PHASING

No matter which pole or poles of an I-T-E Molded Case Circuit Breaker are affected by an overload or short circuit, all contacts open simultaneously. The combination of a circuit breaker and properly applied motor controller is an unbeatable combination to guard against single phasing.

7. LOW POWER LOSS

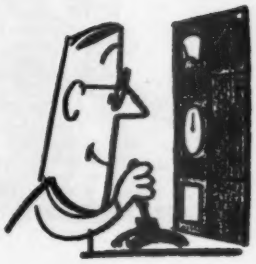
High contact pressure, silver alloy contacts, and electrically welded connections in I-T-E Molded Case Circuit Breakers assure minimum watt loss. Year after year, a circuit breaker can save you lots of money in power costs.

For detailed information, see your authorized I-T-E distributor or write to I-T-E Circuit Breaker Co., Small Air Circuit Breaker Division, 19th & Hamilton Sts., Philadelphia 30, Pa. In Canada: Eastern Power Devices Ltd., Port Credit, Ont.



2. REDUCES PRODUCTION DOWNTIME

I-T-E Circuit Breakers save dollars by eliminating lost man-hours, lost machine-hours, and lost production. Anyone can tell a tripped breaker at a glance—no need to locate and replace blown fuses. Once a fault has been cleared, it is only necessary to reset the breaker.

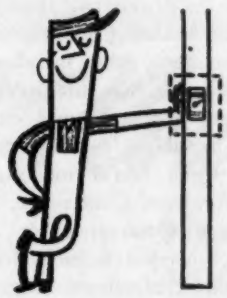


3. UNIFORMITY OF OPERATION

All I-T-E Molded Case Circuit Breakers are factory set and tested. At least two tests are made at 200% continuous current rating to make certain breakers trip within the proper interval of time.

4. COMPLETELY TAMPERPROOF

Breaker tripping mechanisms are sealed—calibrations cannot be altered. And circuit breakers eliminate the dangerous possibility of inserting incorrect rated fuses.

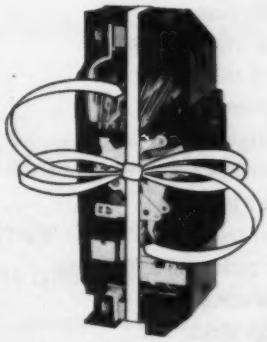


8. SAVES MOUNTING SPACE

I-T-E Molded Case Circuit Breakers are compact. Space means money, and the relative compactness of I-T-E Circuit Breakers is another reason why circuit breakers mean greater economy for you. For example, a 600 amp enclosed circuit breaker is 6 in. shorter, 7 in. narrower, and 2 to 3 in. shallower than a comparable rated fusible switch.

9. VERSATILITY IN APPLICATION

A very wide range of special attachments and enclosures are available. This broadens the application of circuit breakers to meet all of industry's diversified requirements. For instance, remote tripping of breakers or remote visual or audible signals of breaker operation are available for special applications. There are I-T-E Molded Case Circuit Breakers to meet your requirements with maximum economy and safety.



10. UNDIVIDED RESPONSIBILITY

I-T-E Circuit Breakers are manufactured, tested and sold as a unit. Fusible switches and fuses are not. When you buy an I-T-E Molded Case Circuit Breaker, you are buying lifetime assurance of consistent and coordinated protection.

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Heard Around Headquarters

A GROUP of approximately 20 consulting soils engineers, meeting during the American Society of Civil Engineers convention in New York, (see "Field Notes" on page 118) voted to investigate the necessity for forming a separate organization.

The consultants, who admitted they are suffering "growing pains," explained that soils engineering has grown rapidly only since World War II. Prior to that time, many of the functions of a soils engineer were handled by drillers.

Possibilities mentioned for the soils engineers were: joining the Consulting Engineers Council, ASCE, or NSPE (as a functional section).

David M. Greer, chairman, said another meeting of the soil consultants will be held when the committee completes its report — at the next ASCE national convention or sooner if possible.

At the NSPE Meeting

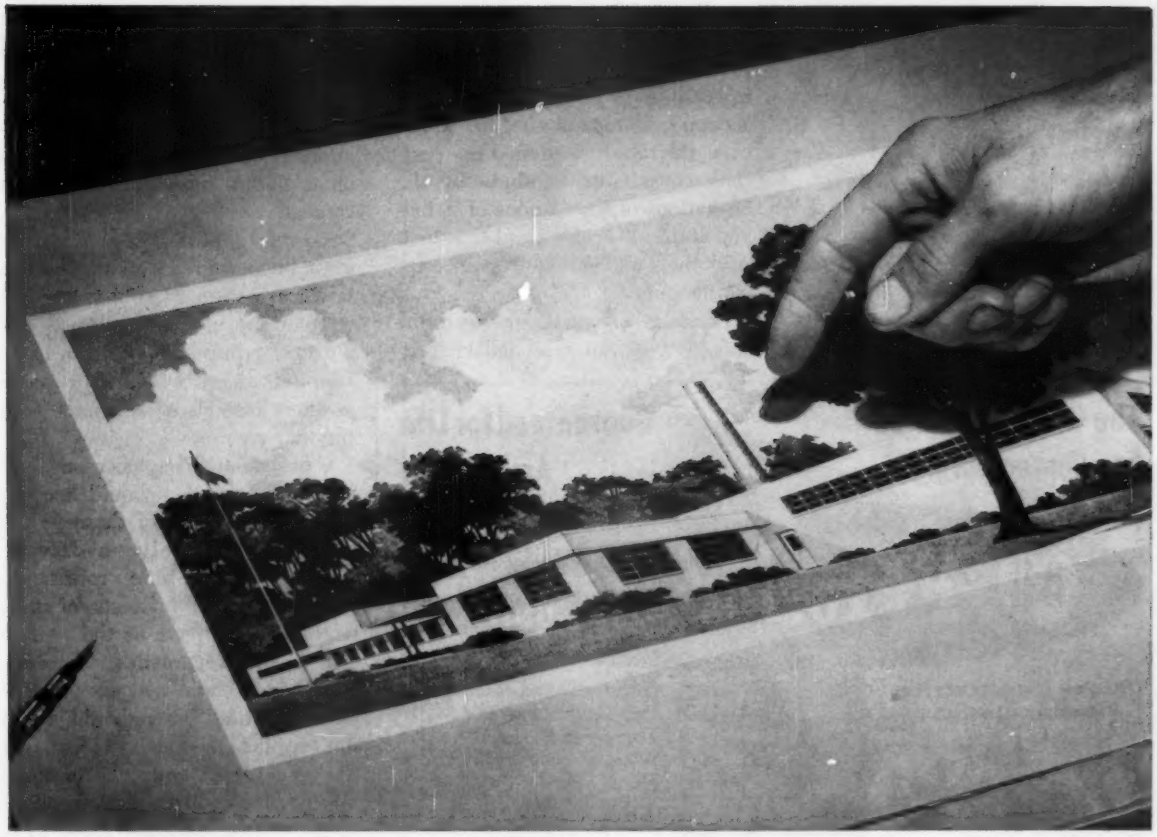
The National Society of Professional Engineers, which soon will seek a dues increase through a membership vote, announced at a board of directors meeting in San Francisco that a number of society functions will have to be curtailed for the time being because the 1959 program covered more than the budget did. However, there is hope that all — or at least most — of the items that had to be dropped can be financed through a voluntary fund drive.

Among the things the 1959 budget does not provide for are "an annual report, distribution of the 'Criteria for Professional Employment' to Engineering students, sufficient financing for the functional sections, any membership program other than the Introductory Plan, a revised and current chapter handbook, per diem to any of the three board meetings, a State Presidents' Conference, State Secretaries' Conference, or . . . the much-needed finances for reserve, the Professional Engineers Conference Board, or a modest contingency fund."

The report added, "It was with deep regret that the budget committee came to the conclusion that it would be necessary to eliminate from the budget financing of the NSPE activites in connection with Engineers' Week."

When and if the NSPE gets sufficient donations, programs first to be restored to the roster would be Engineers' Week ($9000); Annual Report ($10,000); and the hiring of two clerical people for the Washington office, plus their desks and equipment ($8500).

Current NSPE dues are $10 per



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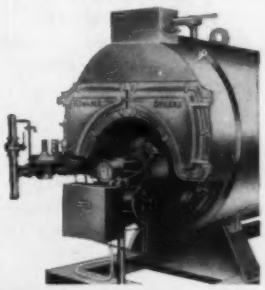

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member. The ballot will ask that a $20 maximum be set, with actual dues of $13 beginning in 1960. The dues increase requires a two-thirds majority of those voting, with at least a vote of 20 percent of the membership.

During policy discussions, a set of rules for "moonlighters" was suggested by the Functional Section for Consulting Engineers in Private Practice. "Both tradition and law recognize that any person legally qualified to practice a profession may do so as a full-time practitioner or on a part-time basis in addition to other activities," the section's statement began. However, the report cautioned the part-time consultants to abide by the limitations of the Canons of Ethics and Rules of Professional Conduct. And they added a few points for clarification:

¶ Those in salaried employment should avoid any secondary professional practice which raises the slightest question of a conflict of interest.

¶ The interests of the major employer are paramount in any situation in which the private engagement might represent a possible conflict.

¶ Secondary professional activities must be performed on the professional engineers' own time and without the use of the major employer's equipment, facilities, or supplies, except where appropriate arrangements have been made with the major employer.

¶ A professional engineer engaged in outside practice should keep in mind the interests of those in the profession who rely on private practice as a full-time professional activity. In the interests of protecting all elements of the profession in private practice, those engaged in outside private practice on a part-time basis should apply the applicable local professional fee schedule or custom in accordance with accepted professional ethics.

¶ In case of any doubt whether outside practice will harm the professional engineer's major responsibility to his employer, the consent of the employer should be sought.

The board adopted a much shorter version—a compromise between the government and the consulting engineers functional groups. The official NSPE policy now is that "employed professional engineers may engage in outside professional practice on an individual voluntary basis within the limitations of applicable laws, regulations, and ethical standards."

In other policy discussions, NSPE approved in principle the Functional Plan for Unity. It added that "NSPE has refrained from entering into technical activities and to this extent is practicing the basic concept of the plan. NSPE has no activity in conflict with those of the Engineers Council for Professional Development

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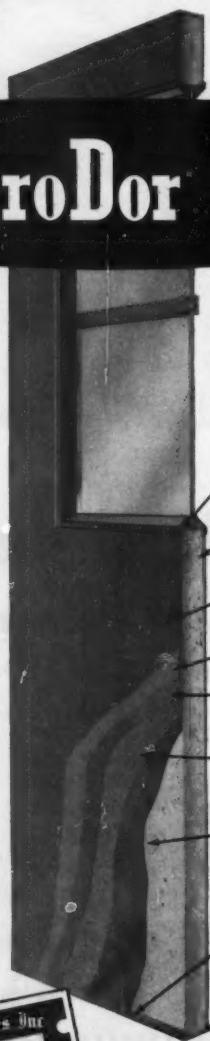

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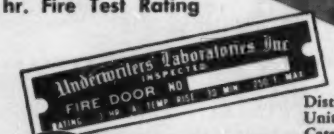

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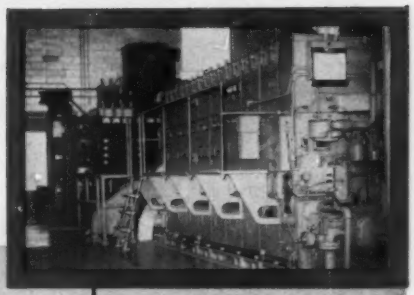

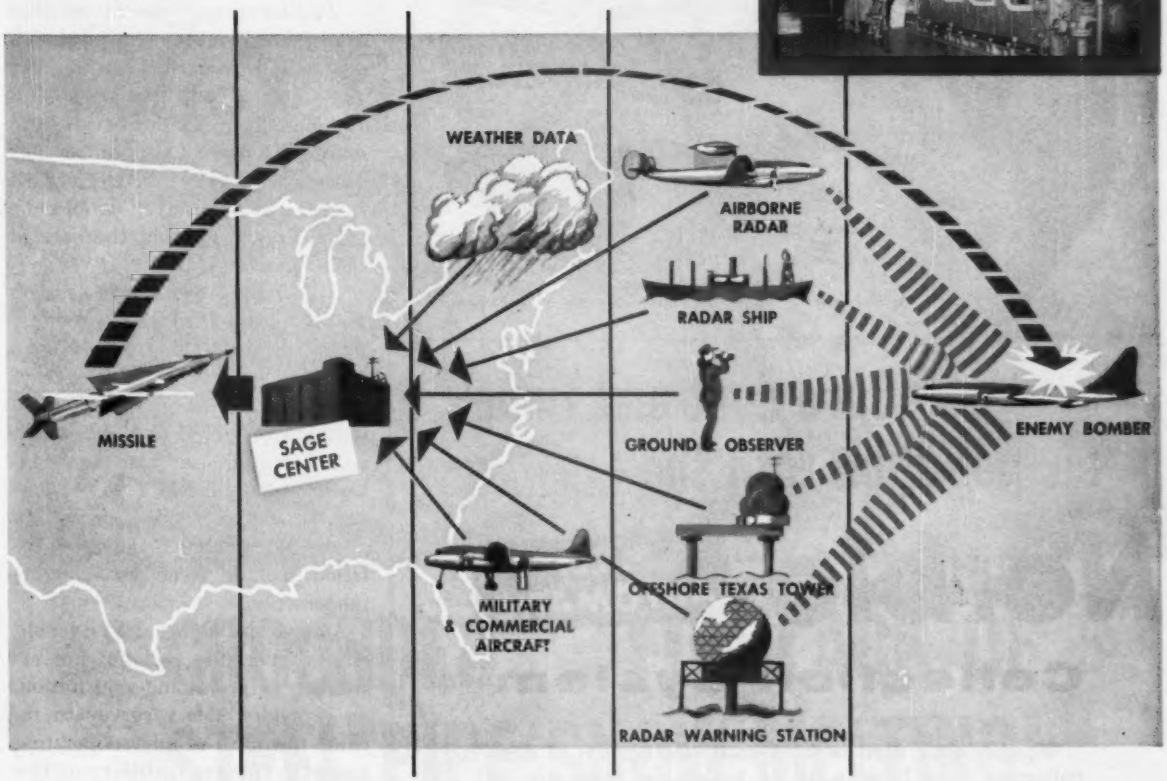

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Equipment failure could mean disaster in jet-speed atomic war, so reliability of every piece of SAGE equipment is absolutely essential. Dependable White Superior Diesel engines meet U.S. Air Force requirements for supplying power to SAGE units. These high-quality, heavy-duty engines are world-renown for continuous, dependable operation and quick, easy starting. Precision construction provides long, trouble-free performance with low maintenance and maximum fuel economy.

Collecting vital infomation for SAGE are various radar outposts, also powered by Superior diesels, like the "Texas Towers" (Early Warning Radar Stations) and "DEW" line (Distant Early Warning) . . . proof again of Superior's rugged dependability. Similarly, White's Superior engines can be custom-engineered to your exact requirements. White's accumulated know-how includes experience with automatic, unattended and remotely controlled operations. If your requirements range from 215 to 2150 horsepower, or 150 to 1500 KW, profit from White Superior's many advanced design features.

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The full capacity of equipment designed for you is maintained by a number of Norblo features, most important of which is the cyclic bag cleaning or shaking action. Controlled by a highly efficient timing system, the cleaning involves only one bag compartment at a time — for a few seconds only — with no variation in capacity.

Motive power for bag shaking and air reversing valve operation can be either pneumatic or mechanical-electrical. The former is usually more economical where an ample supply of compressed air exists. The mechanical type, actuated by electric motors and duplicating the pneumatic operation, is particularly valuable for outdoor installations where compressed air lines might freeze; or for isolated locations of the equipment where compressed air is not available.

Send a description of your air pollution problem. Let Norblo engineers suggest the best solution. Or write for Bulletin 164.

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Norblo ENGINEERED DUST COLLECTION SYSTEMS FOR ALL INDUSTRIES

and will continue its activities in support of ECPD programs."

In a more detailed plan for unity, the board voted that membership requirements at the national level remain unchanged for the time being.

The Committee on Interprofessional Practice also requested that the NSPE president write the presidents of other societies (just the Founder Societies at present) and invite them to appoint a continuing observer to the NSPE board. This observer would be given the privilege of the floor at board meetings.

NSPE voted to offer its services and publications to members of cooperating societies – which again brought up the ugly subject of money. "There undoubtedly will be services desired of NSPE which will materially increase both inherent costs of NSPE as well as specific staff time. Thus, it will no doubt be essential that implementation include some financial arrangements."

Among the things NSPE could offer cooperating societies are assistance in promoting registration, an expanded salary survey to include members of any cooperating society, the availability of the Washington office for any government liaison required, and the Board of Ethical Review would consider cases submitted by the cooperating society.

The Society suggested that liaison between NSPE, EJC, and ECPD be on an organization rather than an activity level. And the committee is making further studies on the advisability of NSPE applying for EJC membership.

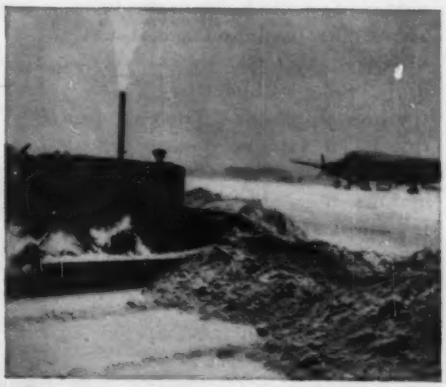
In a statement on the present and future need for engineers, NSPE reaffirmed its policy of quality and not quantity. "Potential engineers should be better grounded in fundamentals when they enter the engineering educational program and should be better informed as to the qualifications essential for an individual to become

GROUNDED . . . FOR LACK OF STEEL PIPE SNOW MELTING!

At airports all through the snow belt it was the same story last winter . . . plane traffic delayed or suspended altogether until runways could be cleared of heavy snow.

Many engineers believe that in the jet age the only practical solution to airport snow removal problems will be found in *steel pipe* snow and ice melting systems for runways, loading areas and hangar approaches. Otherwise, these 10-mile-a-minute airplanes will simply "hurry up to wait."

Steel pipe has a solid background of success in snow melting systems just as it does in radiant heating, fire sprinkler systems, vent and drainage lines, electrical conduit, refrigeration, structural use, gas, oil and water lines. It is the most widely used metal pipe in the world because it is the least expensive and the most versatile.



Photos show bulldozers clearing heavy snow at two large airports.

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The only outlet from these compartments is via holes in the belt above. Surplus liquid and slimes discharge through these "overdrain" holes without mixing with the oncoming sands. The end result is an extremely clean sand discharge, excellent de-sliming—making the "Overdrain" Classifier an ideal washing device.

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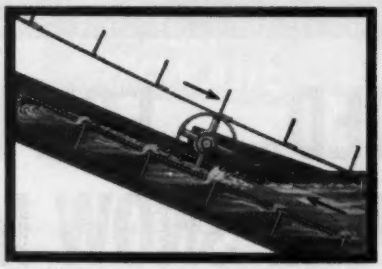

Section through "Overdrain" Classifier showing upward-moving, closed, washing compartments.

Unretouched photograph of "Overdrain" action above the belt—water and slimes discharging upwardly.

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a successful engineer," the policy states.

It added that an artificial stimulation to further increase enrollments in engineering would severely handicap school facilities. Besides, it pointed out that engineering enrollment already is at an all-time high. As to those who think a crash program would solve America's space lagging, the policy mentioned that "a program starting today will not produce a single highly qualified engineer or scientist for at least six years."

In closing, the policy suggests that proper utilization of the engineers already available is the best step toward solving immediate problems.

NSPE policy also endorses the organization of "sounding board organizations," to help employees and employers solve their problems. (The New York State Society already has a similar group working with the city employees.)

The policy defines a "sounding board organization" as a "nonbargaining association of engineers, including those in management, employed by one employer, whose purpose is to improve communications between professional engineering employees and management by serving as an objective fact-finding body, and whose activities are carried out in accordance with the professional concepts of NSPE."

The NSPE is encouraging state societies to organize souding board organizations. Sounding board members could become affiliated with local chapters whether or not they are registered. However, these affiliates gained through sounding boards would not have a vote in local, state, or national activities "except as allowed in the local or state constitutions."

When it reported, the Functional Section for Consulting Engineers in Private Practice said some of the items under current discussion are: a study of the Rules of Ethical Conduct and their applicability to private practice, competitive bid-

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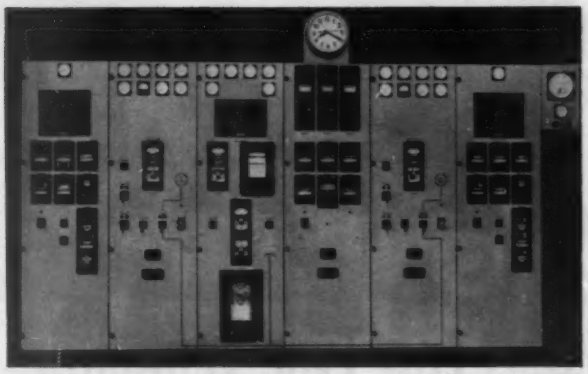
is born of many men's efforts



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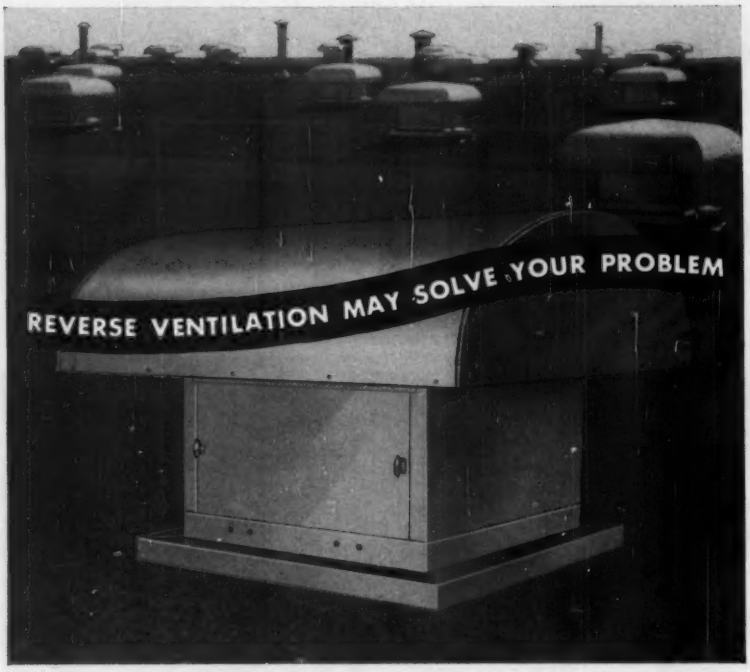

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Mechanicals Meet

The American Society of Mechanical Engineers annual convention, now being held in New York City, suffered pleasant growing pains this year.

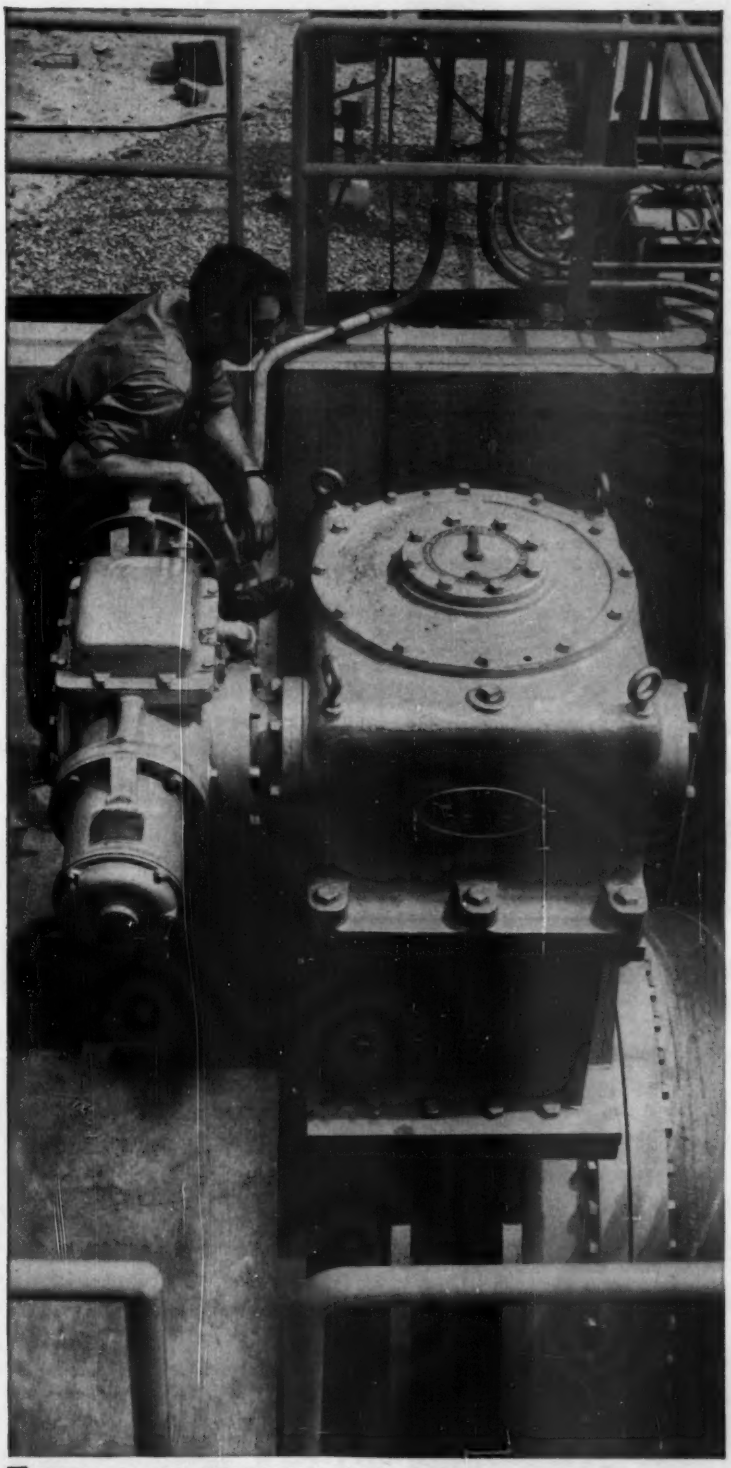
A few years ago, one large New York hotel was sufficient to hold the ASME convention with ease. The American Rocket Society, for several years, also scheduled their convention jointly. Last year, ASME and ASRE occupied two hotels. This year, ASME alone is occupying two New York hotels, and spilling over with delegates who had to take rooms at a number of locations away from the two convention headquarters. And with a minimum of 13 joint sessions being held simultaneously during the convention, a number of committee meetings had to be scheduled at locations away from the convention because all meeting rooms were occupied.

The Rocket Society, which held its annual convention in November, did not seem overly upset at having to schedule meetings separate from the Mechanical Engineers. As the ARS preconvention report pointed out: "It (the convention) will mark the first time ARS members will not have to wend their way through congregations of boiler and railroad engineers from ASME to get to our own sessions."

N. J. Association Actions

The New Jersey Association of Consulting Engineers has adopted a constitution which grants membership on a firm basis to engineers in good standing who have been in private practice for at least two years. The grade of associate member was created for engineers who have not had their own businesses for two years.

Entrance fee, which can be



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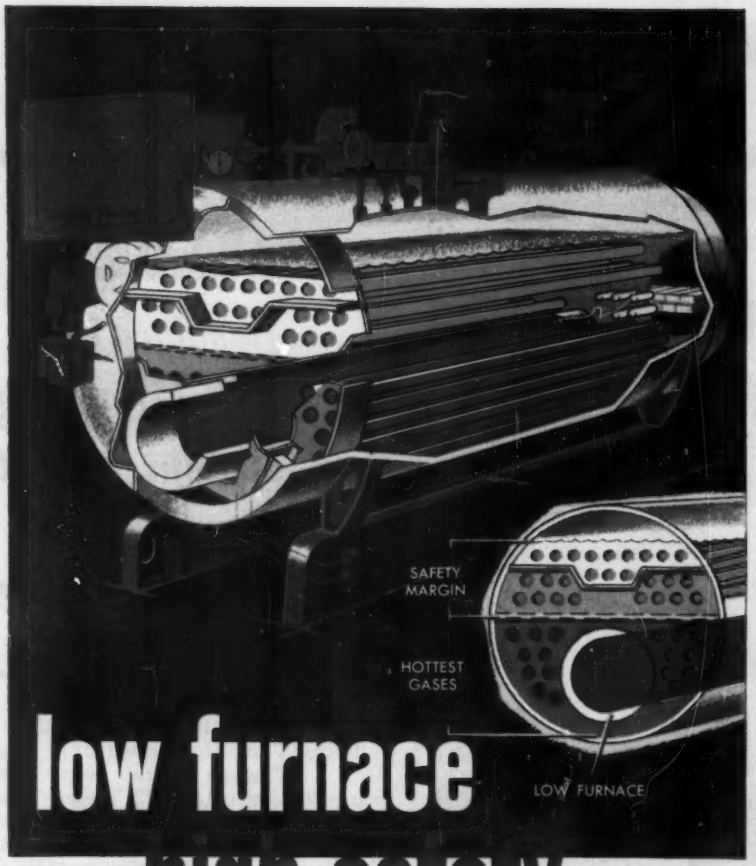

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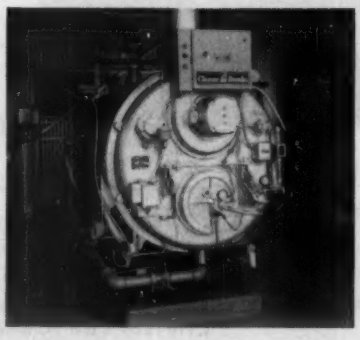

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waived for any individual or group at the discretion of the membership, was set at $25. Annual dues are to be set forth in the bylaws.

The executive committee was authorized to propose a special levy if the condition warrants.

AIChE Advanced Program

The American Institute of Chemical Engineers, at its annual meeting in Cincinnati this month, will inaugurate something new in the way of a program — "advanced concepts for members knowledgeable in the various fields of Chemical Engineering, rather than an elementary appreciation for those without appropriate background."

The program announces as further warning, "Lecturers will assume that attendees have an adequate mathematical understanding of this subject matter."

Topic of the first of these advanced lecture series will be "New Ideas in Turbulence."

AIEE Meeting Canceled

The American Institute of Electrical Engineers had to cancel its fall general meeting this year because of the hotel strike in Pittsburgh. It does not plan to meet again until the winter general meeting, to be held Feb. 1-6 at New York City's Hotel Statler.

Washington Council Grows

The Consulting Engineers Council of Metropolitan Washington (D.C.) was one year old last month, and has grown to an organization of 29 firms with 40 principals.

Kenneth W. Cobb, president, said the Metropolitan Council will join the Consulting Engineers Council "when and if we have anything to offer." He explained that they also would consider what CEC has to offer. "But first we must get our dues on a basis which enables our local organization to be effective."

Cobb hopes to see his group develop closer liaison with local chap-

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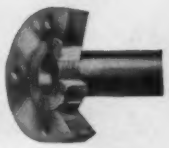

Cutaway view shows pipe expanded into Insert Flange

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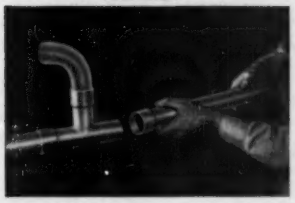

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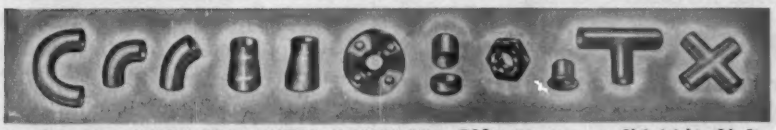

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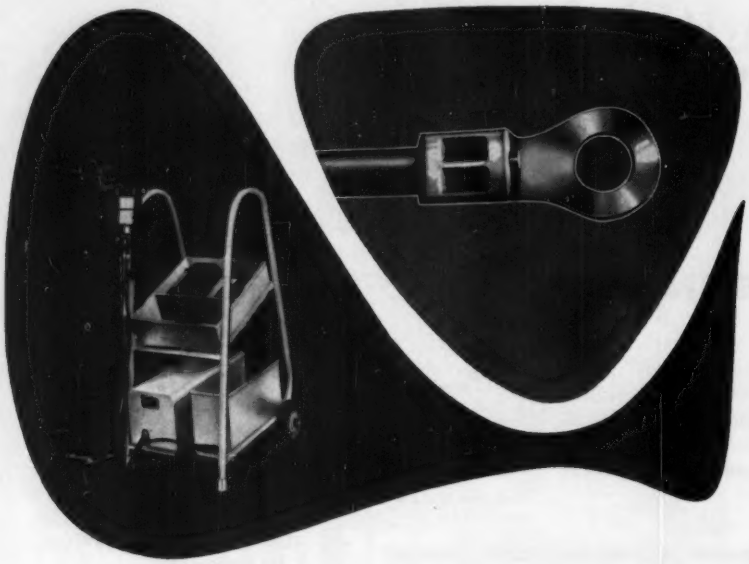

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ters of such organizations as NSPE and AIA. The consultants also hope to work closely with regional offices of the government, and they will cooperate fully with CEC when the Council's national headquarters are moved to Washington.

EJC-ECPD Unity

The Engineers Council for Professional Development, at its annual meeting in St. Louis, took a step toward unity with the Engineers Joint Council. Paul Lange, secretary of EJC, was elected assistant secretary of ECPD.

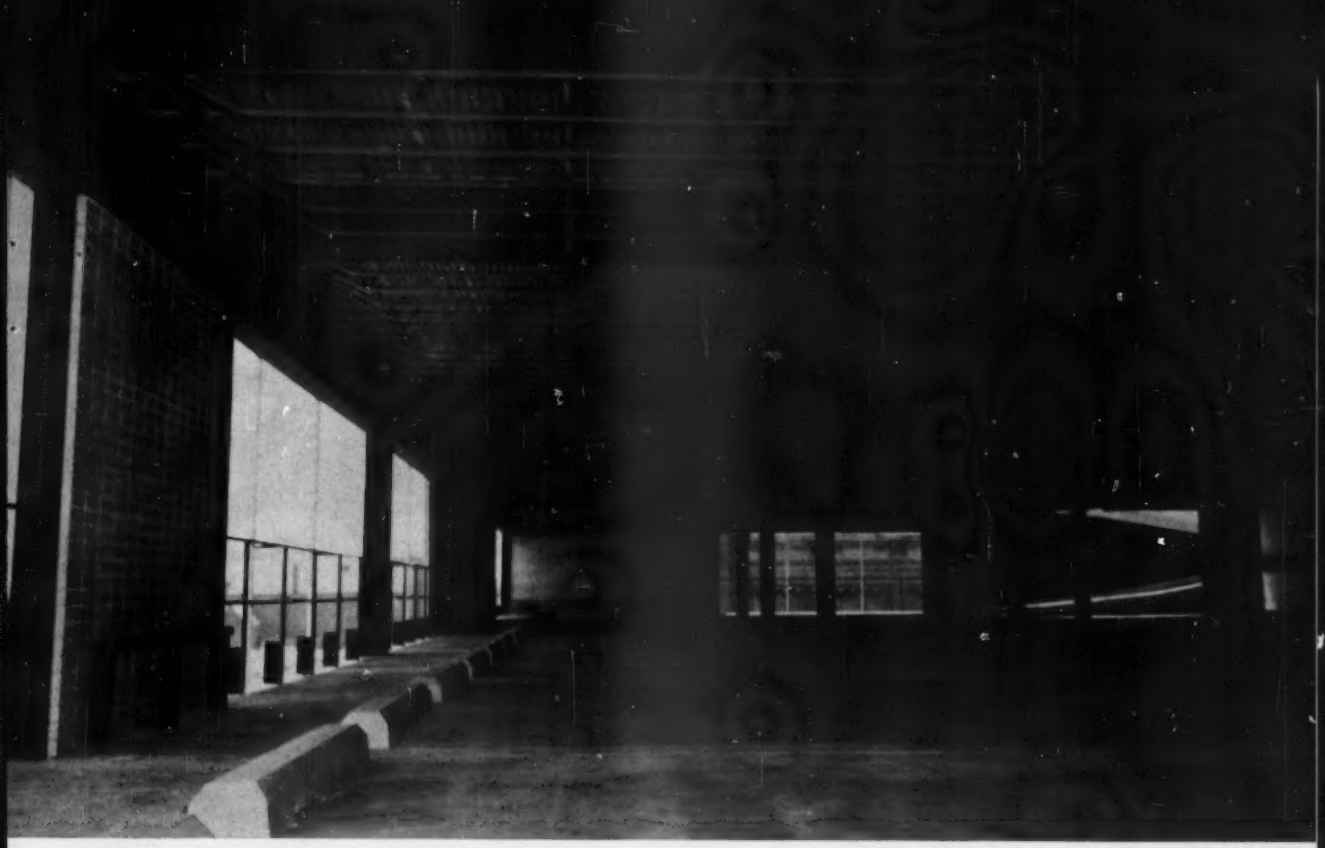
The idea of a joint secretary dates back four years, when EJC and ECPD approved the suggestion as a part of a report emphasizing that the autonomy of the two groups be continued, but that coordination of operational functions was desired.

A six-man committee also was appointed to investigate the possibilities of an eventual EJC-ECPD merger. Named to the committee for EJC was Louis Howson, past-president of the American Society of Civil Engineers; A. B. Kinzel, president of the American Institute of Mining, Metallurgical, and Petroleum Engineers; and George Holbrook, president of the American Institute of Chemical Engineers. Representing ECPD on the committee are Warren McCabe, of Brooklyn Polytechnic Institute; Harold Hazen, Massachusetts Institute of Technology; and J. M. Garrelts, of Columbia University.

ASHAE-ASRE Merger

The American Society of Refrigerating Engineers and the American Society of Heating and Air-Conditioning Engineers are deciding on Dec. 1st if the two groups want to merge. Voting will be done by ASRE in New Orleans, and ASHAE in Chicago. Results will be known on the night of Dec. 1st.

The merger looks like a sure thing. Both governing councils have approved the idea by a sizable margin. ▲▲



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THIS new 9-level parking garage in downtown Gary, Indiana, is a good example of all-weather construction.

Erection of the 340-car, 125′ x 210′ x 45′ steel-frame building proceeded without interruption right on through the winter. Cold weather did not interfere with the construction of 118,125 sq. ft. of floors, since AmBridge Standard Steel Joists could go up independent of the flooring. Thus, concrete could be poured immediately after each level was completed, or at any convenient time.

This carport was designed by Beine, Hall & Curran, Architects and Engineers, and constructed by Witter-Gaddis Corporation, both of Gary. American Bridge fabricated and erected 189 tons of AmBridge Standard Steel Joists and erected 500 tons of structural steel.

USS AmBridge Steel Joists provide rigid, lightweight and economical construction for any type of floor, roof and ceiling.

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The Legal Aspect

MELVIN NORD, P.E.
Consultant in Legal and Technical Problems
Patent Attorney

The Law of Real Property:

Licenses, Real Covenants, and Equitable Servitudes

LAST MONTH'S COLUMN discussed two of the "rights in the land of another" – easements and profits. Consultants also should understand three others – licenses, real covenants, and equitable servitudes.

Licenses

A license is a revocable privilege to go on land possessed by another. If the use of the land is entirely incidental (as in attending a theater), the license is not an interest in land; otherwise it is, and a license may be very similar to an easement, aside from the fact that it is revocable and that the uses involved need not fit into historical categories.

Even if a license is binding as a contract (because of consideration), there is still power to revoke it, though this will subject the licensee to liability for breach of contract. However, where the licensee has made considerable expenditures and undue hardship would result, the courts have refused to permit revocation before the agreed-upon time. This may be put on the ground that the contract is specifically enforceable, as relating to land.

Another exception to the rule of revocability of licenses relates to "licenses coupled with an interest," which always are held to be irrevocable, at least for a reasonable time. Thus, where one has placed his personal property on land, under a license, he has a license coupled with an interest, and this cannot be revoked until he has had a reasonable opportunity to remove the chattel.

Real Covenants

If the owner enters into a contract with someone in such a way as to restrict his own use of the land, and then sells the land to another, is this subsequent purchaser also bound by the contract? If the purchaser promised to be bound when he took the land, he is bound. But even if he never promised to be bound, and even though the restriction is not technically an easement, he nevertheless may be bound if the contract is a "real covenant" or "covenant running with the land." In order for it to be, it must meet the following requirements: (a) the agreement must "touch and concern the land," rather than being purely a personal one; (b) the parties must have intended that the agreement would run with the land; and (c) there must be "privity of estate" between the parties at the time the agreement purportedly attached to the land. By "privity of estate" is meant a temporary or continuing relation such as the landlord-tenant relation, owner of an easement-owner of servient estate, or vendor-purchaser of land. It is possible for the burden to attach to one land and the benefit to another, or only one may attach to the land while the other is purely personal. This

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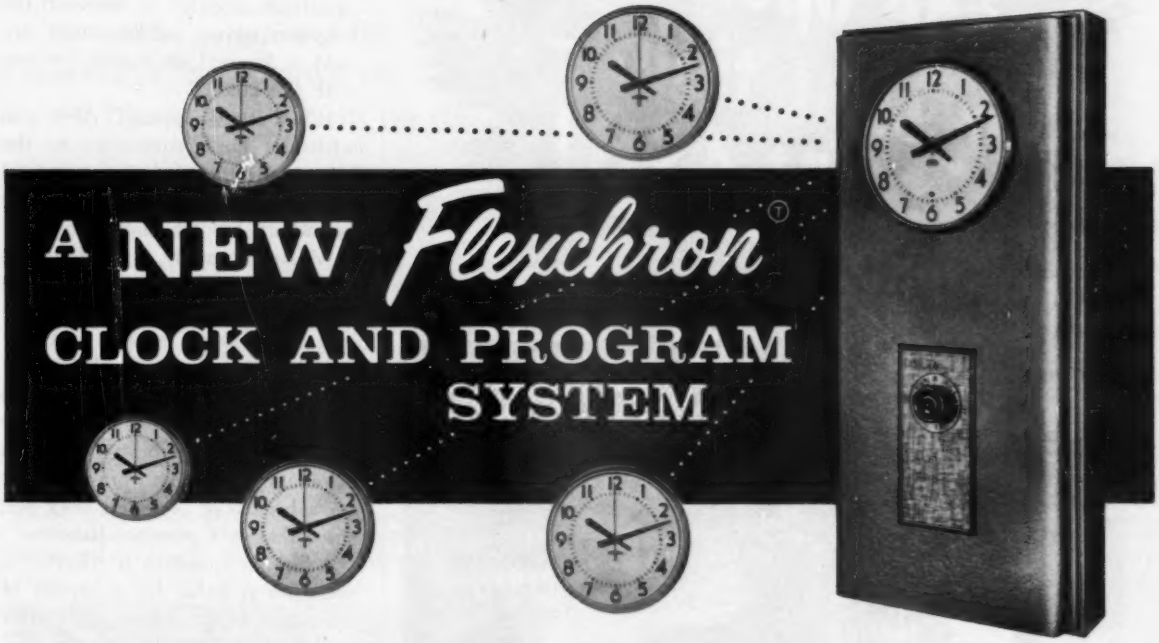

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When a power failure occurs, the Master Clock & Program Controller keeps running on a built-in power reserve in which no batteries are used. When electric service is restored, program signals sound on schedule and all secondary clocks are automatically reset. And since each secondary clock has its own resetting mechanism (under control of the Master Clock) all clocks are synchronized to the same time, *including the sweep second hand.*

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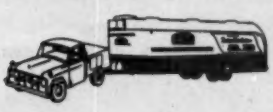

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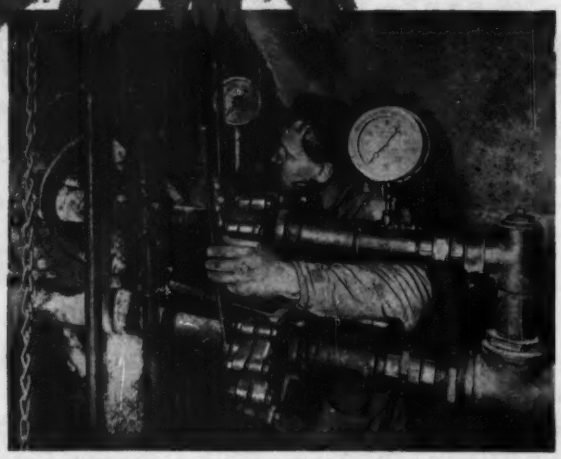
wide open . . . or shut tight — in a FLASH!



It takes less than a quarter turn to open an Everlasting Valve *wide* or close it *tight*. That's one of the many reasons why these time-proven valves are so popular wherever quick valve action is desired . . . on equipment outlets, storage and measuring tanks, process lines, boiler blow-offs, spray lines, meter testing, etc.

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depends on whether benefit and burden separately meet the tests.

The most common covenants in real property are those involved in leases. Some of these are personal (contractual only) as between the original parties, while others are held to be real covenants (to run with the land).

When the covenant does run with the land, successors to the leasehold estate and of the general ownership will generally each be bound on the covenant, since the covenant normally will attach to both interests. However, a question which arises is whether a successor of one of these estates must respond in damages for a breach of covenant by his predecessor in title. The answer is that he does not. Although liability under a covenant may run to him, liability for a breach of covenant does not, since that is a personal liability.

A similar question is whether a successor is liable for a breach of covenant which occurs only after he has sold his interest. The answer is that he is not liable merely on account of privity of estate, since he is no longer "in privity," having divested himself of his estate. However, he may be liable because of privity of contract. That is to say, if he did not merely take his estate subject to the covenant, but expressly assumed the covenants, the owner of the other interest (the lessor, if the person in question is the assignee of the lessee) is a third-party beneficiary of the contract involving the assumption of the covenant.

Covenants prohibiting a lessee to sublease or assign his estate on pain of forfeiture of his estate are an example of real covenants. There is also an implied covenant for quiet enjoyment on the part of the lessor. It too is a real covenant, running with both the possessory and future estates.

A landlord is not required by law to repair the premises. However, if he has covenanted to do so, he is obligated. Such a covenant

Amvit VITRIFIED CLAY LINER PLATES

protect concrete structures from disintegration

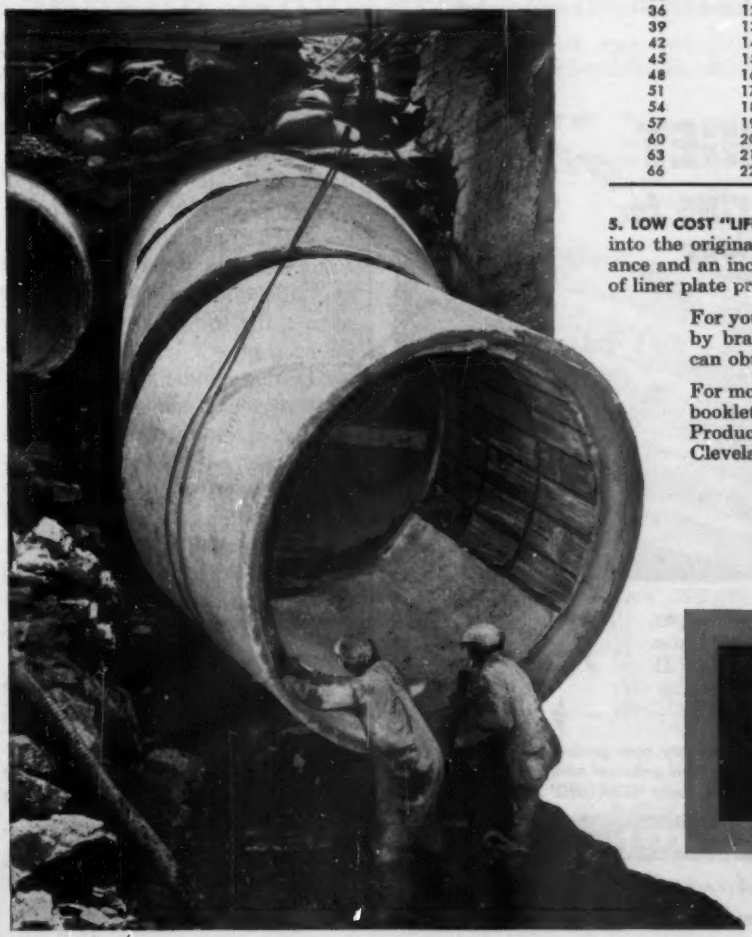
CLAY LINER PLATES ARE UNAFFECTED BY EROSION, ABRASION OR CORROSIVE ACIDS OR GASES

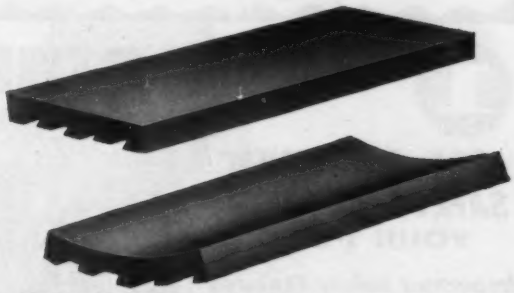
For complete protection of concrete pipe sewers, industrial sewers, acid vats, sewage treatment tanks, neutralizing baths, culverts, retaining walls, and bridges use Amvit clay liner plates for these five big reasons:

1. RESISTS ACID ATTACK — Amvit Liner plates are specially manufactured to meet all application requirements which entail resistance to acids, alkalies, and chemical reaction. They are made of the same high grade clays that go into famous Amvit sewer pipe. They are formed, dried, and vitrified to obtain clay pipe density and hardness.

2. PREVENTS ABRASION — Amvit Liner plates are not affected by the wearing action of sand, rocks, gravel, or other solids often encountered in streams and rivers. They protect all surfaces against corrosion and abrasion.

3. EASY INSTALLATION — Amvit Clay Liner Plates, hardened, glazed, and durable, permanently bond and lock to masonry and concrete work. They are easily installed on concrete forms and are sized according to standardized specifications for uniform spacing.





4. SIZES FOR EVERY JOB — To meet the applications of liner plates in industry, sewerage, and drainage, they are manufactured flat or curved, in 24-inch lengths, 9 inches wide. Lengths under 24 inches for special applications are available on request.

STANDARDS FOR CURVED LINER PLATES

Diameter Sewer	Pieces Required For Circle	Radius	Diameter Sewer	Pieces Required For Circle	Radius
Inches	Number	Inches	Inches	Number	Inches
24	8	12	69	23	33
27	9	13½	72	24	33
30	10	16½	78	26	45
33	11	16½	84	28	45
36	12	18	90	30	45
39	13	21	96	32	45
42	14	21	102	34	45
45	15	21	108	36	60
48	16	24	114	38	60
51	17	26¼	120	40	60
54	18	26¼	126	42	60
57	19	26¼	132	44	60
60	20	33	138	46	60
63	21	33	144	48	72
66	22	33			

5. LOW COST "LIFE INSURANCE" — Building Amvit Liner Plates into the original structure assures a reduction in maintenance and an increase in life expectancy far beyond the cost of liner plate protection.

For your next job, specify *Amvit Clay Liner Plates* by brand. Your local concrete pipe manufacturer can obtain them on short notice.

For more information, write or call for our detailed booklet on Amvit Liner Plates. American Vitrified Products Company, National City Bank Building, Cleveland, Ohio, or our office nearest you.

SINCE 1848

AMERICAN

American Vitrified Products Company

NATIONAL CITY BANK BUILDING
CLEVELAND, OHIO

two superior open steel
FLOOR GRATINGS
BY GLOBE

1 Safety GRIP-STRUT®

FOR MAXIMUM SAFETY ALL OVER YOUR PLANT

Important Safety Features

★ FIRE PROOF ★ SLIP PROOF
★ MAXIMUM STRENGTH
★ MINIMUM WEIGHT

Important Economy Features

★ All one piece, not welded, riveted or expanded
★ Open space in excess of 55% of area for easy access of light and air
★ No extra supports necessary—channels are integral part of the material. ★ Self cleaning
★ Cut and installed like lumber by your own maintenance force. ★ Low in original cost. ★ For balconies, no secondary sprinkler heads needed

Ideal for work platforms, stair and ladder steps, flooring, balconies, catwalks, machinery guards, fire escapes and for original equipment safety treads.

2 GOLD NUGGET® WELDED grating PAT. PENDING

The QUALITY GRATING for Heavy Duty Applications

★ 3/16" projection weld nugget for greater rigidity and strength
★ Vertical alignment of the main load bar assured
★ All bars are load carrying bars including secondary bars
★ Anti-skid pattern

PROJECTION WELD
Each secondary load bar (A), as projected welded to the primary load bar (B) has a shear strength of 5,000 pounds per weld. There are 28 such projection welds to a square foot of grating. This means that GOLD NUGGET Welded Grating can sustain greater shock loads than other gratings.

For the complete details of these revolutionary new gratings, write for new catalogs today. Distributors in all principal cities. Consult the yellow pages in your phone book under "GRATING".

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is a real covenant, running with both interests in the land. A covenant to pay rent is also a real covenant, and therefore liability may attach to assignees from the lessee by privity of estate as well as by privity of contract.

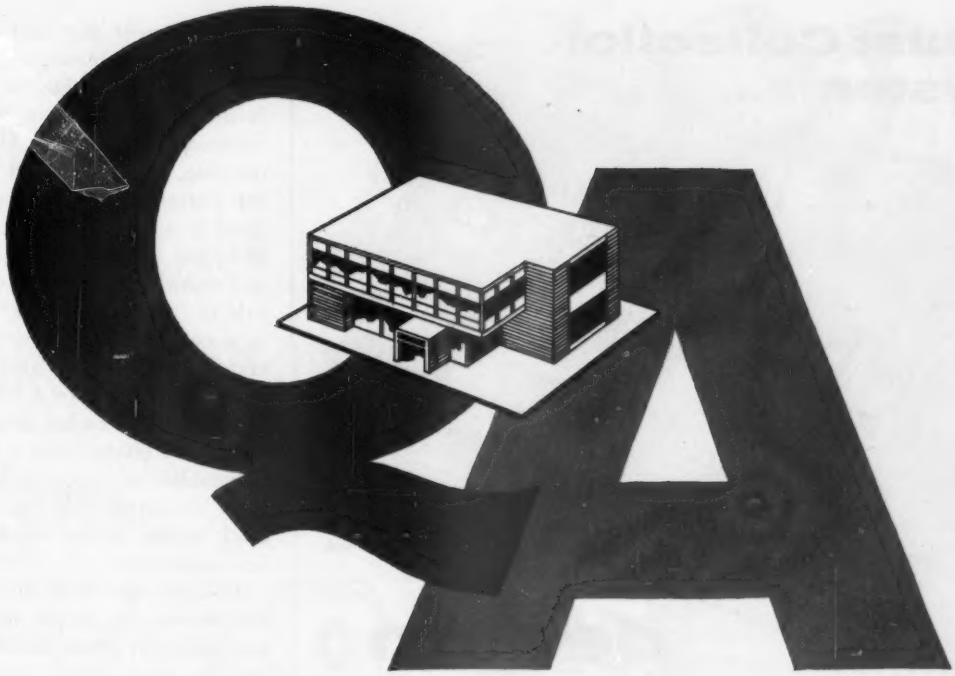
Other real covenants, which run with interests in the land, include: a covenant to insure, a covenant to pay taxes, a covenant providing for renewal or extension of the lease at the lessee's option, and a covenant providing the lessee with an option to purchase.

Equitable Servitudes

The concept of "real covenants" constitutes a liberalization of the original concept of easements. Real covenants are not restricted historically to only a few particular types of rights (air support, way, water, and fencing), but may be of any nature, so long as the requirements are satisfied. Nevertheless, to keep the doctrine of real covenants within bounds – so that purchasers of property will not unexpectedly be bound by promises made by their predecessors – the courts have placed some limitations on the doctrine, and one of these, "privity of estate," is inherently rather restricted in nature.

For example, it may happen that two adjoining landowners wish to restrict the use of their property for each other's benefit. This cannot be done under the doctrine of real covenants, since there is no "privity of estate" between them; and it may not be possible to obtain easements either, because the subject matter may not be one of those historically acceptable for easements. Such a covenant would be binding on them personally, but if they sell their land, their successors will not be bound.

Another example of the failure of the doctrines of easements and real covenants to satisfy the intention of the parties is where the agreement has not been reduced to writing, for then it fails to satisfy the Statute of Frauds. In fact,



Johnson Answers Your Questions about Temperature Controls for Small Buildings

Q **Aren't Johnson Pneumatic Controls installed exclusively in the *larger* buildings?**

A Definitely not. It is perfectly true, of course, that Johnson has installed the pneumatic control systems in a majority of the country's well known major buildings. But, it is equally true that Johnson has provided control systems for many thousands of quality built small and medium size buildings of all types.

Q **Exactly how big does a control installation or building have to be before you can use pneumatic controls?**

A Size has nothing to do with it. You use Johnson Pneumatic Controls whenever you want and need dependable, accurate, trouble-free controls. Whether you need two room thermostats or 20 or 200 is unimportant. With Johnson, small jobs are done as carefully as the large ones.

Q **Isn't it easier for the architect and engineer to use packaged or "over-the-counter" controls on small jobs?**

A Quite the opposite, for Johnson assumes complete responsibility for the entire control job—planning, manufacturing and installing. Johnson will first design a system to fit your exact needs. Then, Johnson engineers and full-time installation mechanics will be on hand with the necessary materials when needed. Work is done on schedule, without construction delay. This start-to-finish service relieves you of concern over planning, estimating, supervisory and installation details. It can be a big help to you.

Q **What about the client's future service problems?**

A Johnson's interest in a job never ceases. Prompt, expert maintenance and repair service is available directly from Johnson for the life of the building. This keeps clients happy and leaves you free to do your real job. Johnson installations are backed by the oldest and largest service organization in the industry.

Q **How do I get more facts?**

A Just call your local Johnson branch or write Johnson Service Company, Milwaukee 1, Wisconsin. Better still, on your next project, let a Johnson engineer plan the control system and submit an estimate. No obligation, of course.

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PNEUMATIC SYSTEMS

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SF Precipitator at a steel plant.

design makes the difference

Higher efficiency of Buell 'SF' Electric Precipitators is the result of exclusive engineering features. For example, Buell's *Spiralectrodes* emit 50% to 100% more electrons than other types . . . and *maintain* their efficiency. Positive gas flow control through adjustable baffles prevents scouring and eddying. And Buell's Unique Continuous Cycle Rapping practically eliminates "puffing".

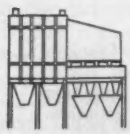
BUELL CYCLONES

Lower installation cost of Buell's time-proved simplified design makes erection faster and easier. Spiralectrodes, for example, are self-tensioning, require no weights. Flexibility of power supply means easier installation, operating safety.

"SF" ELECTRIC PRECIPITATORS

Lower maintenance cost is the result of many details of superior design. And sectionalized design permits shutting down part of a unit without interrupting service in the rest of the unit.

Get full information: write for a copy of "Buell SF Electric Precipitators", a 22-page booklet. Write to Dept. 47-L, Buell Engineering Co., Inc., 123 William Street, New York 38, N. Y.



PRECIPITATOR-CYCLONE COMBINATIONS

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Experts at delivering Extra Efficiency in

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the agreement may not even be binding as a contract.

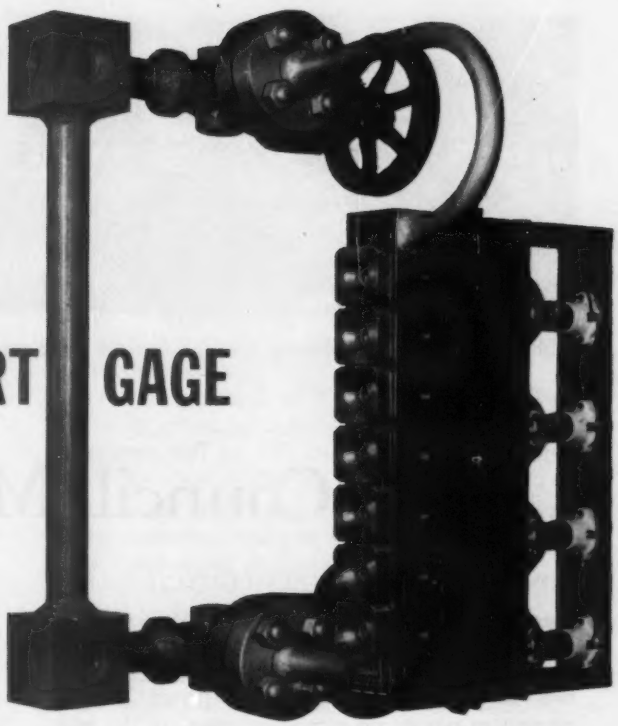
In order to liberalize the law further, the doctrine of "equitable servitudes" has evolved. Under this doctrine, there is no need to satisfy the Statute of Frauds by a writing, there is no need to fit within the historical categories of easements, and there is no need to satisfy the rule of "privity of estate." If there is a mutual intention to attach a certain covenant to land, with a benefit attaching to a "dominant estate" and a burden attaching to a "servient estate," that is sufficient to establish an equitable servitude. Such covenants also run with the land, insofar as the equity courts are concerned.

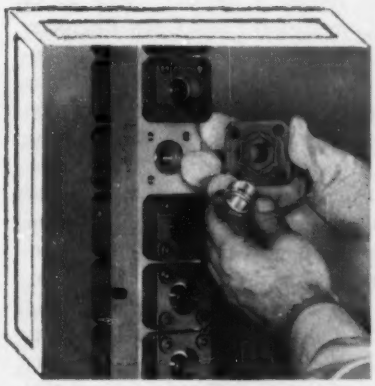
The principal example of equitable servitudes occurs in connection with restrictions placed on lots sold by a subdivider. Let us suppose that O originally owns all of Blackacre. He sells lot #1 to A, placing a restriction in the deed on A's use of lot #1 to the effect that he will not build a house within a certain number of feet from the street. This is a real covenant, for the benefit of the remainder of O's land. Next, O sells lot #2 to B, placing a similar restriction in the deed on B's use of lot #2; this runs to the benefit of what still remains of O's land. O continues in this way, selling each lot with similar restrictions in each deed, intending a uniform scheme of restrictions.

Suppose, however, that B prepares to violate the restriction. Can A bring an action against B to prevent this? Theoretically, the answer should be no, because the real covenant between B and A runs only in one direction (to the benefit of B). D has rights against C, B, and A; C has rights against B and A; B has rights against A; but A has no rights under the restriction scheme! This is obviously not what was intended. Thus, the equity court steps in, upon request, and makes the restrictions mutual.

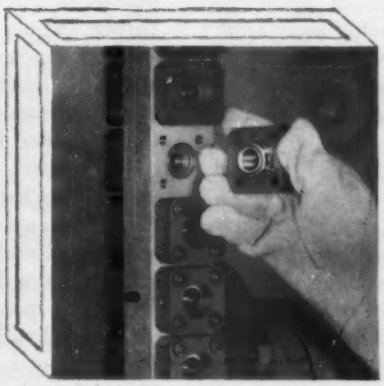
This just goes to show that the law is not so stupid, after all. ▲▲

servicing the new YARWAY COLOR-PORT GAGE is easy as a b c

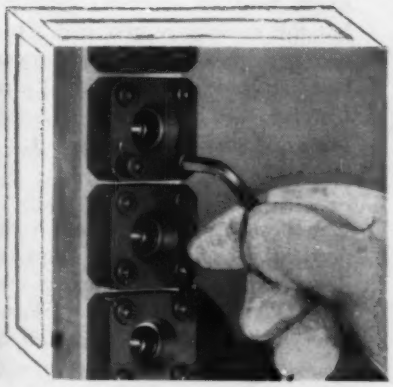




a Remove four cap screws and lift off cover assembly (held in right hand). Install new port assembly (glass-mica-gasket, shown in left hand) in cover. This port assembly is part of the complete cover assembly.



b Re-install complete cover assembly. Sealing gasket automatically seats in gasket groove in body.



c Tighten down four Allen cap screws with standard wrench (no torque wrench required).

New Yarway Color-Port Boiler Water Level Gages (for pressures to 3000 psi.) offer not only this new ease of maintenance but insure brilliant red and green readings of steam and water.

For full details, write for Yarway Bulletin WG-1814.

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SPECIFY YARWAY WITH CONFIDENCE

Semiannual CEC board meeting in Dallas brought delegates from 20 member associations representing 1000 firms.

C. E. Council Meets in Dallas

CONSULTING ENGINEERS COUNCIL held its semiannual Board Meeting Nov. 6-9, at the Statler Hotel, in Dallas, Texas. Directors and alternates from 20 member associations were present to hear committee reports on accomplishments of the past six months and approve plans for the months ahead.

CE exclusive

The Council is a young federation and still spends much time on internal organizational problems, but this meeting represented a turning away from the past practice of concentrating solely on its own navel. It looked up and observed the problems of the 1000 firms of consulting engineers, large and small, that support it.

Government Work

The Washington, D. C. liaison work of the Council is perhaps the outstanding example of work being done directly for the benefit of consulting engineer firms. John K. M. Pryke, of Slocum & Fuller, and George A. Heft, of G. A. Heft & Company, had a meeting the end of October with Max Barth, of the Department of Defense. The main purpose of the meeting was to present to Mr. Barth an analysis of replies to a questionnaire sent out to association members. This questionnaire had to do with fees and profits or losses in connection with engineering work done for the various branches and agencies of the armed services. The results of the survey showed that engineers are making extremely low profits on this government work, and there have been sizable losses on some projects.

This meeting with Mr. Barth indicated an understanding of consulting engineers' problems, at least at this high level of government, and it is likely that this vital question of fair fees not only will receive attention but will be adjusted soon.

As a result of this and other meetings a new relationship has been established with the Department of Defense, a relationship that establishes a favorable climate not only for the eventual solution of major differences but for the immediate clearing up of many minor problems in consulting engineer-government dealings.

The Council also has dealt directly with the Bureau of Public Roads in meetings with F. C. Turner, Deputy Commissioner and Chief Engineer; with the Bureau of Yards and Docks through Captain E. L. Hanson; and with the Public Housing Authority through Orville R. Olmsted, Assistant Commissioner for Development. In all of these meetings with government agencies, the representatives of the Council found no prejudice against the use of consulting engineer services but on the contrary an understanding of the functions of consultants and a desire to deal in a professional manner. All of these top administrators requested that the Council call to their attention activities of any of their regional offices that conflicted with professional methods of practice. They promised that immediate action would be taken.

In turn, the Council's Washington liaison requested that members of the Council's associations submit facts concerning any unprofessional methods used by any government agencies in dealing with consulting engineers so that these could be passed on to responsible Washington officials.

As a result of the work done in Washington during the past months, it is clear that much more can be accomplished by direct dealings with government officials than had ever been suspected. The major limitations imposed on this aspect of the Council's work are those of time and distance — trying to work through volunteer committees with

members located all about the country while the Council office is still in Springfield. Recognizing this, it was recommended to the board that plans for a Washington office and an increased staff be pushed as rapidly as possible. Since specific figures on cost of office space and additional personnel were presented, it is likely that the move to Washington will come in 1959.

More Members

The big question of increased membership was approached from several directions. As at all previous board meetings, the membership committee reported on the current status of associations of consulting engineers in the states in which there is currently no affiliated group. In summary, the report showed that there are now in existence 16 state or regional associations that are not yet members of the Council. In 13 additional states there are movements under way for the organization of state associations.

The board also recognized that there is a need for some sort of membership-at-large that will permit participation in Council activities by firms located in areas in which there is no association. At this board meeting provision was made for accepting applications for this class of membership. Basically, this board action permits application for membership-at-large by firms that: (1) are members of a state or regional association of consulting engineers but the association is not currently a member of the Council; (2) are located in areas in which there is currently no association of consulting engineers; or (3) are located in areas in which there is a member association of the Council but the member association has some restriction on membership that prevents the firm joining it.

These new members-at-large would have a vote in the Council through a director elected by mail ballot. The weight of the director's vote will be based upon the number of members-at-large just as the size of a state or regional association now determines the weight of its director's vote.

Members-at-large would be required to become members of their state associations as soon as one exists in which they can qualify for membership.

The creation of this new class of membership was one of the Council's most important actions at this meeting. It means that qualified firms now can participate in Council activity and support the Council without waiting for a Council association in their area.

The Council itself also did some joining. The board acted upon the invitation of the International Federation of Consulting Engineers and voted unanimously to become a member of that organization. The International Federation (FIDIC) had extended the invitation to the Council at their meeting in Oslo, Norway, this past May. Now, with the acceptance of the invitation, the Council becomes the representative for American engineers in private practice in this international body. Other nations whose associations of consulting engineers are represented in FIDIC are Norway, Denmark, Sweden, Finland, The Netherlands, Germany, Switzerland, France, Belgium, and Great Britain. There also has been a FIDIC invitation extended to South Africa, and it is understood that the invitation is to be accepted. Canada also is considering affiliation.

The next meeting of FIDIC will be in The Hague, in either April or May. The Council's representative will be Edward J. Wolff of Chicago, a past president of the Council.

The board of directors also approved the action of the executive committee in applying for associate membership in Engineers Joint Council. It is the feeling of the Council that EJC is the proper body through which various societies and associations of engineers should work when they have activities or projects of mutual importance or when it is advisable that joint committees be established.

The documents committee presented to the board the results of its work over the past two years. This is a printed form of General Conditions of the Contract to be used by members of Council associations in connection with engineer-client prime contracts. These General Conditions can be purchased in any quantity from Council headquarters for use by consulting engineers. It is hoped that their use will become general in connection with all prime contracts of member firms. The documents committee now plans to start work on a standard form for general conditions for interprofessional contracts in which the architect holds the client's prime contract.

CEC Publicity

The Council is most anxious to continue and to expand its public relations and publicity program, begun this year with the publication of a brochure, "Framework for the Future," designed for distribution to prospective clients in industry and government. This brochure is an excellent publication showing the prospective client what a consulting engineer is, what he does, and how he should be selected. It already has received wide distribution, and a second printing has been ordered.

Now, the public relations committee recommends that this project be followed up with a long-range program involving the services of a California public relations firm. The board fully approved this program in principle. Its inauguration involves only the question of financing. ▲▲

Three floors and roof have been lifted and secured for Taylor University dormitory, Upland, Indiana.

Lift Slab Economics

DONALD J. WAKELY, Structural Engineer
Wakely - Kushner - Wakely Associates
ORUS O. EASH, Architect

CE exclusive

WE HAVE LEARNED that lift slab construction can help us erect certain buildings faster and often at lower cost than comparable steel or poured-in-place reinforced concrete designs.

At Taylor University, Upland, Indiana, we recently had an opportunity to make an exact cost comparison of the three widely used methods of erecting a fireproof multistory building. Three complete sets of plans – lift slab, conventional poured-in-place concrete, and structural steel with bar joists – were drawn up for a four-story dormitory of 27,500-sq ft floor area. These plans then were submitted for bids. The cost of lift slab construction was $0.81 per square foot lower than structural steel frame and $0.90 per square foot lower than poured-in-place concrete. These savings were so significant, we decided to analyze them.

Cost comparisons between conventional steel and poured-in-place concrete buildings generally do not favor one design over the other except where structural peculiarities lend weight to a particular design. Material costs for structural steel buildings are higher than material costs for reinforced concrete. However, in this country, the cost of erecting the steel is lower than the cost of forming poured-in-place concrete. These cost differences generally balance one another.

Lift slab construction, on the other hand, sharply reduces forming costs with no increase in material costs. The only additional cost item, compared to poured-in-place concrete, is for lifting the slabs and securing them in place – at about $0.35 per square foot.

A comparative construction cost study of a typical 10-story building with 100,000-sq ft floor area will

illustrate savings inherent in lift slab construction.

Structural Steel. All steel joists, wood for forming, concrete, and electrical, heating, piping, and air conditioning equipment are hoisted and fabricated in place.

Structural Steel	$0.89 per sq ft
Concrete	$0.60 per sq ft
Fabrication	$0.87 per sq ft
	$2.36 per sq ft

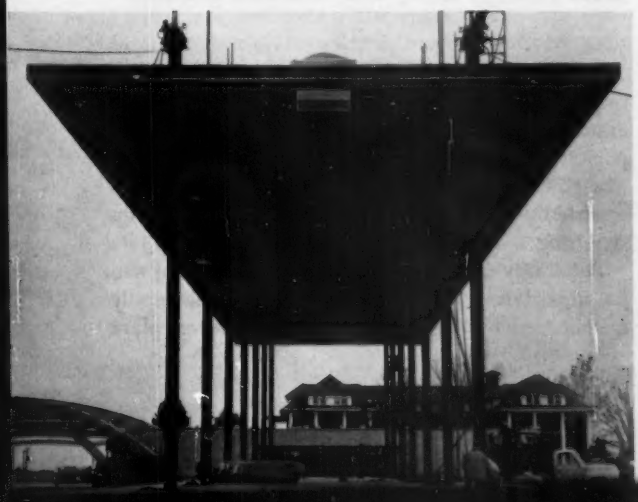
Poured-in-Place Concrete. All reinforcing steel, concrete, and electrical heating, piping, and air conditioning equipment are hoisted and fabricated in place. In addition, a complete deck of wooden forms must be built under each floor, and shoring nailed in place. When the slab is cured, shoring and forms must be disassembled, hoisted, and rebuilt on the next floor. Much of this lumber is unfit to reuse when the building is completed.

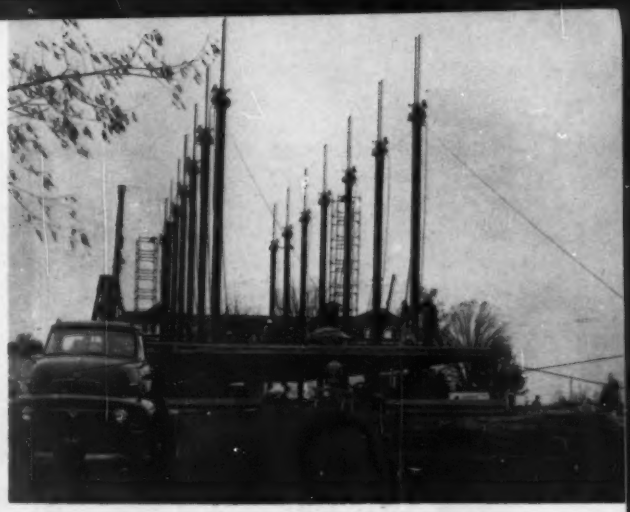
Reinforcing Steel	$0.59 per sq ft
Concrete	$0.88 per sq ft
Forming Labor and Materials	$0.87 per sq ft
	$2.34 per sq ft

Lift Slab. Only perimeter forms are needed – requiring about five percent of the materials and labor needed to form poured-in-place concrete. Slabs are poured on top of one another, separated by a thin film of plastic painted on the top of each slab. When cured, slabs are lifted into place, and welded to the supporting columns.

Reinforcing Steel	$0.59 per sq ft
Concrete	$0.88 per sq ft
Forming Labor and Materials	$0.04 per sq ft
Lifting and Securing Slabs	$0.35 per sq ft
	$1.86 per sq ft

Roof slab is almost in place. Skylight opening was formed while slab was down at ground level.





Roof slab, first to be lifted, is slowly raised by an interconnected system of hydraulic jacks.

In this comparison, savings of $0.48 per square foot are realized by use of lift slab construction compared to poured-in-place concrete. The greater savings of $0.90 per square foot on the Taylor University dormitory can be accounted for because of a number of factors in its design favoring lift slab methods. The floor plans were very regular, there was a minimum of large internal floor openings, and installed mechanical equipment was limited.

The tabulations illustrate that lift slab economies are directly due to reduced forming costs – the only area where important cost-cutting is possible. Savings in concrete or steel in ordinary buildings cannot be made without sacrificing strength.

Additional lift slab economies include:

¶ Reinforcing steel can be unloaded directly on the slab at ground level.

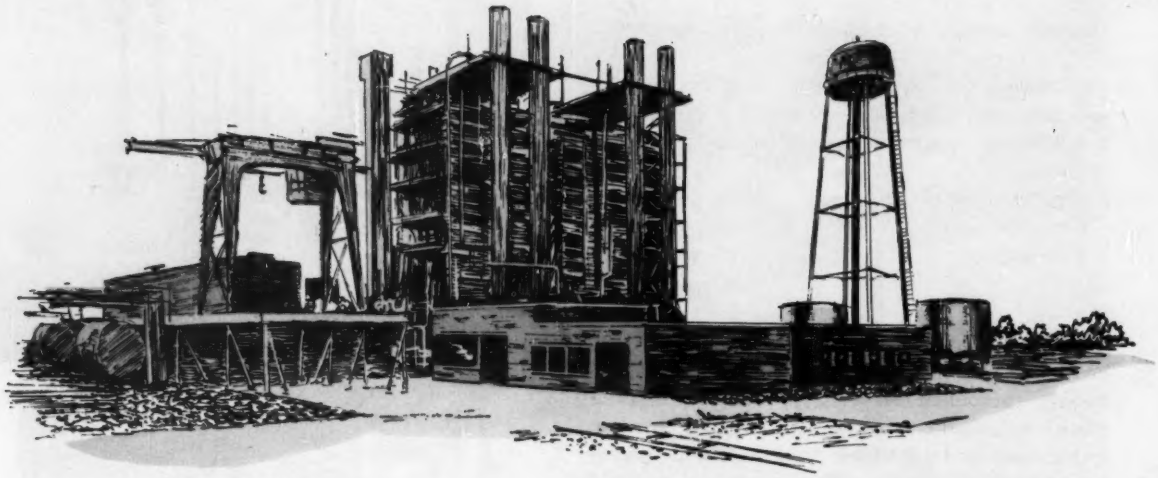
¶ Electrical, plumbing, and other subcontractors work faster on the ground. Equipment and materials often can be unloaded directly on the slab to speed handling.

¶ Construction materials such as masonry, windows, and curtain walls can be put on the slab and raised with the slab.

¶ Insurance costs are reduced. One contractor reports insurance savings of $80,000 in three years.

Lift Slab Limitations

Several of the limitations of lift slab construction must be considered. Certain design problems are created where column spacing is irregular. Placement of utilities near columns is limited. Lift slab construction also does not lend itself to multistory buildings with radically different floor plans and to buildings such as hospitals with complex mechanical equipment. But we have found that careful design can overcome some of these limitations, and that lift slab construction can help erect a sound building quickly and economically ▲▲



A Comparative Engineering Analysis of Feed Pump Drives

F. A. RITCHINGS, JR. and MICHAEL W. LARINOFF
Ebasco Services Incorporated

F. A. Ritchings, Jr., Assistant Consulting Mechanical Engineer, came to Ebasco in 1937 after one year with DeLaval Steam Turbine Company following his graduation from Stevens Institute of Technology with a Mechanical Engineering degree. Except for a four-year wartime stint as Lt. Commander in the navy, he has been with the firm ever since. In 1945, he was made Project Engineer for design of steam-electric stations; in 1948, he became Group Supervisor and Project Engineer responsible for supervision of all steam-electric station design. Mr. Ritchings was made Chief Mechanical Engineer in 1951. He is registered in 14 states.

Michael W. Larinoff received his B. S. degree in Mechanical Engineering from the Illinois Institute of Technology in 1941 and an M.S. degree from the Massachusetts Institute of Technology in 1948. He joined Ebasco Services in 1946 after his World War II naval service as engineering officer of P-T boat bases in the South Pacific. He worked in the Mechanical Design and Construction Department until 1952 when he was transferred to the Consulting Department. His experience in the power generation field is both broad in scope and specialized in detail, ranging from system power studies to solving noise abatement problems.

INCREASING SIZE of boiler feed pumps in today's steam-electric power plant requires that the consultant examine more closely the comparative costs and operating characteristics of the various boiler feed pump drives. Careful selection of the most suitable drive is of prime importance particularly since in high pressure installations boiler feed pump power is now more than half of the plant's total auxiliary requirement. For example, a 250-Mw turbine generator with 2000-psig steam and a single full-capacity pump needs an 8000-hp driver. A new 450-Mw 3500-psig supercritical unit under construction reportedly will employ a single boiler feed pump requiring a 22,000-hp turbine drive.

Reliability of the boiler feed pump drive is of major importance. Statistically speaking, it generally is conceded by engineers that over-all power plant

reliability bears some relationship to the number of operating pieces of equipment; the greater the number of pieces of rotating machinery, the lower the reliability. The arrangement with the least number of elements should have a lower maintenance cost as well as a smaller required inventory of parts. Another important consideration in the selection of the boiler feed pump system is the number of pumps and the size of the standby units, if any. Generally, the fewer the number of main boiler feed pumps and the smaller the standby or backup pump capacity, the less costly the installation but the greater the reduction in generating capacity in event of failure and the more urgent the outage.

Large turbine generator installations usually employ either electric motor, noncondensing mechanical-drive steam turbine, or main generator shaft boiler feed pump drives. Selection of the type and arrangement of the boiler feed pump driver and its associated elements is based on the operating requirements of the project, the economics of investment, and annual operating costs.

Induction Motors

The squirrel-cage induction motor has been the most popular boiler feed pump driver for some time because of its established record of reliability. It is simple to control, flexible in operation, low in maintenance cost, and highly efficient. A two-pole motor of this design can drive either a conventional 3600-rpm pump or a high speed pump through step-up gears. Variable speed couplings of the hydraulic or magnetic type can be introduced between the motor and pump for feedwater flow control, replacing the feedwater regulating valve and permitting pumping power savings when operating at less than full load.

In the larger sizes, however, the induction motor is costly, starting currents are very high, and starting voltage drops are significant. By substituting another drive arrangement for the boiler feed pump motor, it is possible to decrease the size of the auxiliary transformer and sometimes use a lower plant auxiliary voltage, thereby reducing the motor costs of remaining motor-driven plant auxiliaries.

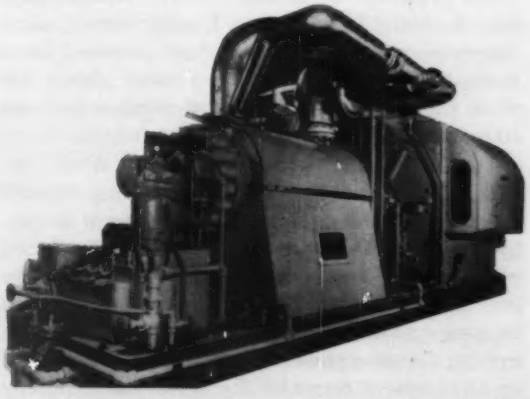
In certain motor sizes and speeds, there are possible first cost savings which can be made by coupling two motors in tandem as has been done in some instances. Motors can be controlled individually or through a common circuit breaker, depending on the degree of operating flexibility desired. With individual controls, each motor can be started separately thereby reducing starting current and voltage drop. Tandem-coupled motors, however, require more floor space than a single motor and have a somewhat higher maintenance cost.

The wound-rotor induction motor is a variable speed driver with certain characteristics similar to the squirrel-cage motor. The motor has several windings which terminate at slip rings mounted on the rotor shaft. An external variable resistance such as a liquid rheostat is connected across the slip rings producing the desired variable speed and torque. Liquid rheostat control permits fine speed adjustment throughout the entire operating range of the motor. Available starting torques for these motors are about 200 to 275 percent as compared to 60 to 75 percent for the conventional two-pole squirrel-cage motor.

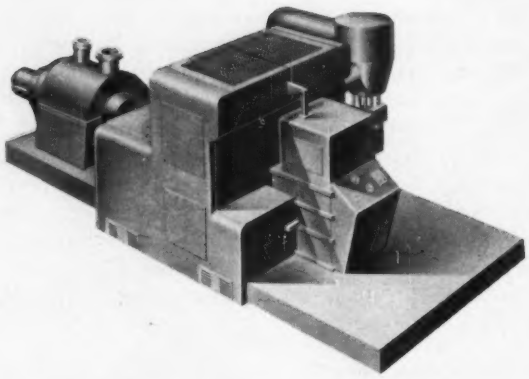
Synchronous Motors

With high speed boiler feed pumps that require step-up gears and generally employ motor drivers rated at 1800 rpm and below, there is a possibility of first cost savings by using synchronous motors. These motors have a unity power factor which can increase the plant's net available reactive capability and also allow for a slight reduction in auxiliary transformer size. Amortisseur windings can be designed for the synchronous motor to give it speed-torque characteristics approximating the squirrel-cage motor. With hydraulic or magnetic variable speed couplings, the synchronous motor can be started with the coupling set for maximum slip thereby reducing its starting requirements. Synchronous motors can be built with larger starter windings if higher starting torques are needed.

The principal disadvantages of the synchronous motor, compared to the squirrel-cage motor, are its somewhat greater space requirements, need for a dc voltage supply, greater control complexity, and conceivably higher maintenance costs. Synchronous motor controls are complicated by the precise automatic switching operations necessary after the motor is started and just prior to the time it reaches



Induction motor-driven boiler feed pump arrangements are simple, flexible, easy to maintain, efficient.



Steam turbine boiler feed pump drives sometimes offer an increased net plant capacity at low cost.

synchronization. These controls must operate to re-synchronize the motor in event of an external fault causing a sudden drop in voltage in the auxiliary circuit. The synchronous motor is more restrictive in its limitation of the number of successive starts that can be made because of overheating of the amortisseur windings. There presently is no known synchronous motor installation in boiler feed pump service in this country, hence it does not have a reliability performance record for this application.

Mechanical-Drive Steam Turbines

The noncondensing mechanical-drive steam turbine is a more complicated driver than either a motor or main generator shaft driver. It is, however, proven equipment which can be expected to have about the same reliability as the main turbine. A small motor-driven boiler feed pump of about 10 percent capacity and 300- to 600-psig total head is necessary for starting the main turbine generator unit from a cold start. Once the main turbine is up to speed and carrying a small load, on reduced steam pressure, the auxiliary steam turbine takes over the boiler feed function. During starting, there are more operater-initiated actions required for a steam turbine drive than for a motor drive. But when the unit is in operation, it requires no more attention than the conventional electric motor drive.

Application of the mechanical-drive steam turbine presents an opportunity of obtaining, in some instances, additional net plant capacity at a relatively small cost. Main turbines can be purchased with the front-end steam chest nozzles opened to pass the additional four percent or so of steam necessary to drive the auxiliary turbine while delivering the same power to the main generator. Such an arrangement increases the net plant output by the amount of the boiler feed pump power. The other design alternative is to maintain the same steam flow to the main turbine generator. This would result in essentially the same net plant output as with the conventional installation.

Main Generator Shaft Drives

The main generator shaft is a convenient means for driving the boiler feed pump. However, this arrangement must be reviewed with the turbine generator manufacturer during the early stages of the project because important design considerations are involved. The drive must not alter the dynamic vibratory characteristics of the turbine generator unit so as to introduce torsional instability or shaft whirl. The drive must be carefully designed so as not to amplify vibration at the generator field collector rings which would result in arcing and premature brush wear. In addition to the usual insulation of the generator end bearing, shaft coupling components must be properly insulated from ground to avoid circulating currents.

Since the main generator rotor must be removed and inspected periodically, the pump drive equipment must be designed for easy removal and re-installation. Depending upon the arrangement, it may be necessary to move the boiler feed pump itself which would require cutting the main feed piping.

Generator shaft drive normally requires the use of a disconnect coupling which permits thermal expansion of the turbine and generator rotors (about one inch for a 250-Mw unit) and provides a quick means of disengaging the feed pump drive in an emergency, without taking the turbine generator off the line. A section of the disconnect coupling is designed to fail in shear in event the pump, step-up gear, or variable speed coupling seizes.

Additional Drive Equipment

The variable speed hydraulic coupling presently has considerable application in boiler feed pump service, having been used in this country since the later 1930s. By the beginning of this year there were more than 500 such units in operation in ratings from 1000 to 6000 hp. When installed between a constant speed induction motor and the boiler feed pump, the hydraulic coupling provides stepless speed control over a speed range of about 5 to 1 with a full load efficiency in the neighborhood of 96 to 97 percent.

The variable speed magnetic coupling is new in boiler feed pump drive application although it has been used in boiler fan drive installations. There presently is only one manufacturer who offers a size of coupling adaptable to the high speeds and high torques necessary for large present-day boiler feed pump drives. The magnetic coupling requires a continuous electric power source for its excitation, while the hydraulic coupling is unaf-

fected by power failure. This coupling appears to have a potential first cost advantage in some generator shaft drive installations. The magnetic couplings in question are designed to permit relative axial movement to accommodate the thermal expansion of the main turbine generator shaft thereby eliminating, in some instances, the need for a disconnect coupling. In addition, this magnetic coupling has a built-in shear section designed to fail in event of boiler feed pump seizure.

High Speed Pumps

Boiler feed pump stages and dimensions can be decreased by designing the pumps for higher speed operation. High speed pumps are well suited to be driven directly by high speed turbines and are practically a must in supercritical pressure plants. A comparison of pump stages, dimensions, and weight of a conventional 3600-rpm pump with a 9000-rpm pump is shown in Table 1. Both pumps are designed to handle 1380 gpm of boiler feedwater at 400 F, with an inlet pressure of 285 psig and a discharge pressure of 2436 psig.

Additional advantages of high speed pumps include lower first costs, a shorter and more rigid shaft since there are fewer stages, and lower casing and bolt stresses resulting from a smaller diameter impeller. High speed pumps require a booster pump to supply their required NPSH in a cycle employing a deaerator. A 6000-rpm pump requires about twice the NPSH of a 3600-rpm pump; hence a high speed pump installation without a booster pump would require a deaerator elevation about twice normal. High speed pumps also require step-up gears if motor or main generator shaft drivers are used. With reasonable maintenance, step-up gears are considered by one large gear manufacturer to have an operating life of 10 to 15 years between major overhauls.

Premises for Economic Study

The comparative economics of investment, operating costs, and differential net electrical outputs associated with alternative boiler feed pump drives were studied for many different arrangements as applied to a 250,000-kw, 2000-psig steam-electric turbine generator installation. Besides the three basic types of drivers—motor, mechanical-drive steam turbine, and main generator shaft drive—various pump sizes, pump speeds, motor speeds, and variable speed couplings were investigated. In all, 58 select and singular boiler feed pump arrangements were analyzed in 102 installation combinations with and without standby. Several of these boiler feed pump arrangements are shown in Fig. 1.

The basic arrangements consisted of either three 33-1/3-percent, two 50-percent, or single 100-percent capacity pumps of conventional (3600 rpm) and high speed (6000 rpm) design. Some of the pump drives were constant speed while others were variable speed, employing hydraulic couplings, magnetic couplings, mechanical-drive steam turbines, or wound-rotor motors. Squirrel-cage induction motors of 1800, 1200, or 900 rpm drove 6000-rpm pumps through step-up gears. The auxiliary, standby, and step-up transformers were sized for the exact kva requirements of each arrangement.

TABLE 1—COMPARISON OF PRINCIPAL FEATURES CONVENTIONAL DESIGN VS. HIGH SPEED PUMP

Number of stages	9	4
Pump speed, rpm	3465	9000
Head per stage, ft	728	1637
Pressure per stage, psi	271	601.5
Impeller diameter, in.	13.8	8.4
Peripheral speed, fps	209	331
Shaft span, in.	87⅜	51½
Weight of rotating element, lbs	900	300
Weight of bare pump, lbs	20850	7750

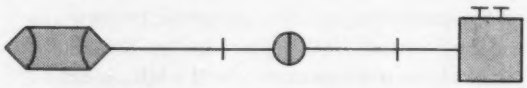
Motor-driven boiler feed pumps and the mechanical-drive steam turbines are mounted on grade elevation in a bay between the turbine generator pedestal and the boiler in a typical outdoor installation. During normal operation the mechanical-drive turbine takes throttle steam from the cold reheat line of the main turbine and exhausts to the deaerator; during startup steam is taken directly from the boiler superheater outlet. There are two steam extraction points on this feed pump drive turbine used for feedwater heating. Generator shaft driven boiler feed pumps are mounted on the top of the turbogenerator pedestal; their motor-driven standby is installed at grade elevation. The pump is driven through a disconnect coupling.

Auxiliary voltage is 4160 volts. Reduction to 2300 volts is possible by using turbine or generator shaft drives, but previous economic studies have indicated that the savings generally are small.

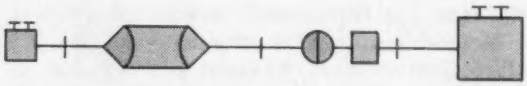
Comparative Economics

The comparative economics of the alternative boiler feed pump drives were based on 1957 prevailing equipment prices. Boiler feed pump power requirements were calculated for the 25, 50, 75, and 100 percent load points for each condition, and fuel costs were estimated for a 35-year operating period under a prescribed loading schedule. Unit fuel costs were assumed to increase over the life of the unit, and net capability available from the plant beyond a certain minimum—as a result of the boiler feed

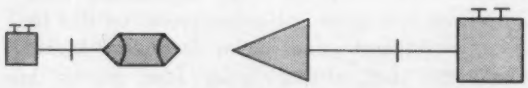
Arrangement A_1—Three 33-1/3-percent capacity main boiler feed pumps, directly driven by three 3600-rpm constant speed squirrel-cage induction motors.
Arrangement A_2—Two 50-percent capacity main boiler feed pumps, also directly driven using two 3600-rpm constant speed squirrel-cage induction motors.
Arrangement A_3—One 100-percent capacity main boiler feed pump, also directly driven by a single 3600-rpm constant speed squirrel-cage induction motor.



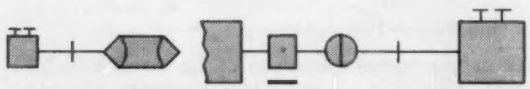
Arrangement B—One 100-percent capacity 3600-2800 rpm main boiler feed pump, arranged to be driven by a single 3600-rpm constant speed squirrel-cage induction motor through a variable speed coupling.



Arrangement C—One 100-percent capacity high-speed main boiler feed pump driven by a single 1200-rpm squirrel-cage induction motor through a variable speed coupling and step-up gears. A booster pump is driven from the opposite end of main motor shaft.



Arrangement D—One 100-percent capacity main boiler feed pump directly driven by a 6000-4800 rpm turbine. A motor-driven booster pump and a separate 10-percent capacity startup pump also are included. The front end of the main turbine generator unit is opened up to permit the additional steam flow that is necessary to drive the boiler feed pump turbine.



Arrangement E—One 100-percent capacity main boiler feed pump driven by the main generator through a disconnect coupling and a variable speed coupling. In addition, a motor-driven booster pump and a separate 10-percent capacity startup pump are included.

Fig. 1 — Five basic boiler feed pump arrangements.

TABLE 2

Arrangement	B	D	E
Driver	Motor	Turbine	Generator Shaft
Investment	$737,000	$907,000	$639,000
Annual charges & costs	$135,000	$102,000	$114,000

pump drive arrangement—was credited at an incremental worth of $11 per kw-year.

A summary cost comparison of the three basic pump drivers, employing single 100-percent capacity pumps without standby (arrangements B, D, and E in Fig. 1) is presented in Table 2. The turbine driver has the highest investment cost, yet has the lowest annual charges and costs on the basis of the established premises. The initial investment is higher because there are added costs for the main turbine generator unit, the boiler, and the feedwater heaters for the added steam flow which generates about 5460 kw of additional net power (includes mechanical-drive turbine). When evaluated at $11 per kw-year, this additional power reduces the total annual charges and costs for the turbine-driven pump installation.

Various Pump Configurations

A comparison of three basic pump size arrangements using motor-driven, constant speed, 3600-rpm pumps without standby is presented in Table 3. The single full capacity pump requires the least investment and has the lowest annual charges and costs but would cause the greatest loss of main generating power in event of pump failure.

Comparison of a constant speed 3600-rpm pump with a pump employing a variable speed hydraulic coupling is shown in Table 4. Both pumps are full-capacity units without standby. The variable speed couplings save pumping power at part loads through more efficient operation. However, the inefficiency of the constant speed pump system with its feedwater regulating valve throttling is not all lost since boiler feed enthalpy is raised at the pump discharge,

TABLE 3

Arrangement	A_1	A_2	A_3
Number of pumps	3	2	1
Capacity per pump	33⅓%	50%	100%
Investment	$870,000	$779,000	$691,000
Annual charges & costs	$155,000	$143,000	$135,000

recovering some of the lost energy in the form of increased feedwater temperature. Depending upon the size of the boiler feed pump, the estimated schedule of part-load operation over the life of the turbine generator, and the unit fuel costs, total fuel savings with the variable speed drive can be greater than that estimated for the particular conditions in question.

Motor-driven high speed boiler feed pump installations have a lower cost pump and motor but an added cost for step-up gears. A first cost comparison of a 100-percent capacity 3600-rpm pump with a 6000-rpm pump driven by a 1200-rpm squirrel-cage motor is shown in Table 5.

The comparison of the total investment and annual charges for the conventional and high speed, full-capacity, motor-driven, variable speed pump units without standby is shown in Table 6. The high speed pumps studied were driven by either 1800, 1200, or 900-rpm squirrel-cage motors. The 1200-rpm motor and gear combination has the lowest investment and annual fixed charges and costs. The investment is from $17,000 to $39,000 lower depending on whether the comparison is made with the 1800 or 900-rpm arrangement and also whether the units are half-capacity or full-capacity size.

Synchronous motors of 1800, 1200, and 900 rpm adaptable to high speed pump drives show some interesting savings of from $21,000 to $63,000 compared with squirrel-cage induction motors. They were not used in the study for reasons discussed previously.

TABLE 4

Arrangement	A_3	B
Pump speed	Constant	Variable
Investment	$691,000	$737,000
Annual charges & costs	$135,000	$135,000

TABLE 5

Arrangement	B	C
Pump speed, rpm	3600	6000
Motor speed, rpm	3600	1200
Manufacturer's quoted prices:		
Complete pump & spare element	$146,000	$127,000
Step-up gear	———	50,000
Electric motor	174,000	159,000
Total	$320,000	$336,000

TABLE 6

Arrangement	B	C
Pump speed, rpm	3600	6000
Motor speed, rpm	3600	1200
Investment	$737,000	$765,000
Annual charges & costs	$135,000	$145,000

New Drive and Control Under Study

A recently devised boiler feed pump drive and control arrangement (Fig. 2) currently is being studied by the authors for possible application in a large installation. A control pump, essentially a variable speed booster pump, takes suction from the deaerating heater and pumps the boiler feed through the high pressure heaters to a constant speed main boiler feed pump. The booster pump is in essence the control pump for the entire boiler feed system. Boiler feed flow is a function of the speed of the booster pump as shown in the head-flow diagram where the system is divided into a

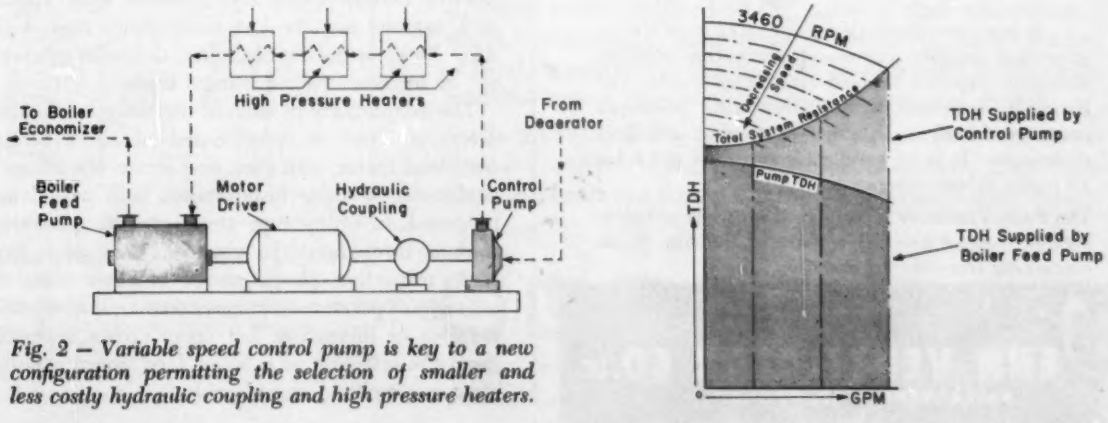


Fig. 2 — Variable speed control pump is key to a new configuration permitting the selection of smaller and less costly hydraulic coupling and high pressure heaters.

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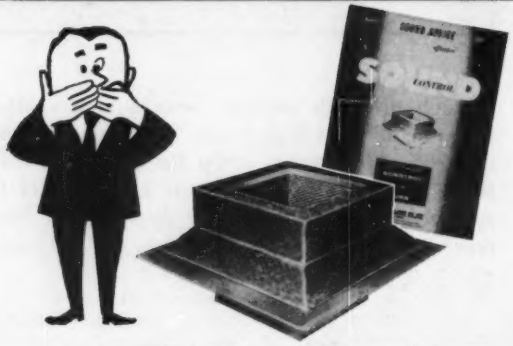

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The variable speed control pump has a TDH that is about 35 to 40 percent of the total requirement for a 2000-psig unit which is sufficient to provide boiler feed flow control throughout the entire range of operation. With this arrangement, the hydraulic coupling is only about 35 to 40 percent as large as that necessary for a conventional installation, and the high pressure heaters have a tube and head design pressure which is also about 35 to 40 percent as high. Depending upon the size and pressure of the turbine generator unit, this arrangement might provide some interesting savings in heater and variable speed coupling costs.

Summary

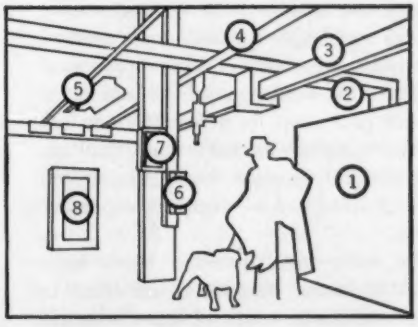
Present-day motor-driven boiler feed pumps are recognized as having an availability approaching that of boilers and turbine generator units. It generally is believed that the two greatest influences which contributed most to the improvement of boiler feed pump reliability were the application of metallurgical advances to pump design and the development of good seals—primarily the packless type stuffing box, which is indicated to have a good measure of success. With this record of proven reliability, the need for boiler feed pump standby is greatly reduced.

It is important that the boiler feed pumps and their drivers do have this high availability as generating units are large and a forced outage is both costly and difficult to replace capacity-wise. In the selection of new boiler feed pump drive arrangements for future installations, it is necessary that the boiler feed pumps and their drivers continue to have this high availability.

The proper boiler feed pump drive is the one which best serves the needs of the installation. These needs must be studied carefully for each situation and the selection based on the merits of the particular circumstances. Economics are only one consideration in the analysis, and however attractive certain drive arrangements may appear, such savings may be lost many times over if the drive limits operating flexibility, degrades availability, or increases forced outage time.

The adaptability of each of the three basic pump drives designed to serve varied situations of fuel cost, load factor, unit size, and steam conditions is evidenced by their installations, both actual and proposed, in utility type steam-electric generating stations throughout the country. They each have their respective shortcomings whether they be economic, operational, or maintenance, and whether tangible or intangible, but once having evaluated them the selection of a boiler feed pump arrangement is simplified considerably. ▲▲

Electrical Planning—*key to efficiency and economy, too!*



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HEAT BETTER ELECTRICALLY

Aerial photo by Haun

To prevent part of U.S. 12 falling in Lake Michigan, offshore pilings were used near Saint Joseph, Michigan.

Protecting Our Shore Lines

DR. ERNEST F. BRATER
Professor of Engineering
University of Michigan

After getting a bachelor of science degree (civil engineering) from the University of Michigan (1934), Dr. Ernest F. Brater worked a year with the U.S. Forest Service, then returned to the university to teach in the engineering department. Besides teaching, Dr. Brater has been a consultant to consulting engineers on dam, erosion, and hydroelectric projects, and has written a number of articles, papers, and handbook sections on hydrology. In addition to various educational groups, Dr. Brater belongs to the American Society of Civil Engineers, American Geophysical Union, International Association for Hydraulic Research, and the American Society for Engineering Education.

SINCE THE EARLY 1900s, there has been a marked increase in the occupation and use of exposed coastal areas, primarily because people have been building homes, cottages, recreational areas, and highways as near as possible to water. Much of this recent construction, particularly in the Great Lakes area, was carried out with little or no engineering design. Buildings and highways were built on land within shifting coastal regions, yet no attempts were made to stabilize such land against the actions of the natural shore processes. As a result, many unsuspecting private property owners, municipalities, and state and Federal agencies have experienced costly damages or have had to construct expensive protective works.

CE exclusive

Unfortunately, many such protective works have proved inadequate, either because of an effort to reduce costs or because of a lack of knowledge regarding wave and current forces. The problem has become so acute that many state agencies, notably in California, Michigan, Ohio, Florida, and Texas, have undertaken research programs to determine the best methods of preventing or alleviating shore damage. In addition, the Federal gov-

ernment has established the U.S. Beach Erosion Board (Corps of Engineers, U.S. Army, Washington, D.C.) for research and design procedures in this field. The Wave Action Section of the U.S. Waterways Experiment Station (Corps of Engineers, U.S. Army, Vicksburg, Mississippi) also has undertaken extensive research programs on problems resulting from the action of waves and currents.

Further evidence of the increasing need for study in this field was the creation of the Council on Wave Research by the Engineering Foundation. This organization has sponsored a series of conferences on coastal engineering during the past 10 years. The published proceedings of these conferences contain much of the important modern literature on this subject. Other information sources are the publications of the Federal agencies and states previously mentioned, the *Transactions* of the American Society of Civil Engineers, and the *Transactions* of the American Geophysical Union.

Winds, Waves, and Currents

The principal causes of beach erosion and shore damage are waves and currents. Waves are generated by winds. The wave height (vertical distance from trough to crest), wave length (horizontal distance from crest to crest), and wave period (time between successive crests) are functions of wind velocity, duration, and fetch (distance over which the wind is in contact with the water).

In deep water there is surprisingly little forward motion; the water particles revolve in nearly closed circular or elliptical paths. Such waves are called oscillatory waves. As waves approach shallow water the paths become more elliptical, crests are sharper, and troughs are wider. Finally, at a depth somewhat greater than the wave height, waves break. The breaker zone marks the transition between oscillatory and translatory waves. In translatory waves water particles move forward at about the same velocity as the wave. Under certain conditions broken waves reform into smaller oscillatory waves one or more times before they finally break at the shore line.

Although some currents result from tides, large-scale circulation systems, or the discharge of rivers, the currents usually most active in shore processes are generated by storm winds and the resulting waves. If the waves strike the shore at an angle, both the wind and the uprush of the breaking waves generate littoral currents. Even when waves move directly toward a shore line, currents are generated by the irregular configurations of the shore. For example, if waves are approaching directly toward the center of a bay, refraction will bend the waves toward the points that form the bay and away from the center of the bay. As a result, waves will be

Beach-building timber groins extend into the water.

Inexpensive rock-filled timber cribs can be effective.

Extensive marine growth solidifies groins of rubble.

Groins plus waves built beach at Brighton, England.

Aerial photo by Hann

Lawn, trees, even houses have tobogganed into Lake Michigan's persistent waters at St. Joseph.

higher at the points and lower in the center of the bay. This generates currents that move from both points toward the center of the bay and thence outward. These outward currents are called rip currents —probably what often is referred to as undertow.

The turbulence from wave action places some material in suspension and helps dislodge larger particles. Littoral currents carry the suspended material and transport the loosened bed material from place to place. Both this material and its movement often are referred to as littoral drift. Most of the littoral drift occurs in the region between the outer breakers and the shoreward limit of the uprushing water. However, destructive erosion has been known to occur well beyond the breaker zone (in depths to 40 feet in the Great Lakes), and significant movement of bottom material also has been reported at depths over 100 feet in oceans.

When waves are large the breaker zone moves into deep water and the uprushing water simultaneously reaches farther in toward shore, greatly increasing the width of the region of severe erosion. Furthermore, the larger waves generate such strong currents that more shore material may be moved during one great storm than during a whole year of normal wave action.

Beach Erosion

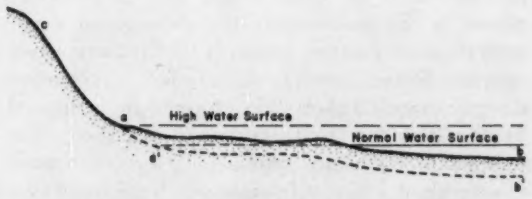
Despite the constant movement of beach materials from place to place, a beach may remain quite stable because material removed at any location is replaced by material from the updrift direction. Beach erosion occurs when the source of supply of replacement material is cut off by, say, a rocky outcrop or a deep river outlet, or if offshore currents carry the material out to deep water. Constructing solid barriers perpendicular to shore (such as jetties or breakwaters) or digging navigation channels close to shore also will intercept the flow of littoral drift and cause an erosion area on the downdrift side.

Beach erosion is objectionable not only because the loss of beach destroys a major portion of the recreational value of the coastal area, but also because it exposes the backshore and bluffs to the destructive power of the waves. This is demonstrated in the accompanying sketch. With a normal water level, the original beach a-b provides protection for the region a-c. But if the water level remained constant while the beach was depleted to position a'-b', the waves could make a direct attack on the bluffs. Region a-c also would be exposed to wave action if the water surface was raised to the higher level indicated even though the original beach a-b was still in place.

Water Level Plays Important Part

Such an increase in water level was the primary cause of the recent extensive shore damage along the Great Lakes. Levels of the Great Lakes vary over a range of 5 to 6 feet from time to time, de-

Permanent dredge for bypassing sand over an inlet at Lake Worth, Florida, on Atlantic coastline.



Without the protection of a long beach (a-b), the wave action of the water would erode bluff a-c.

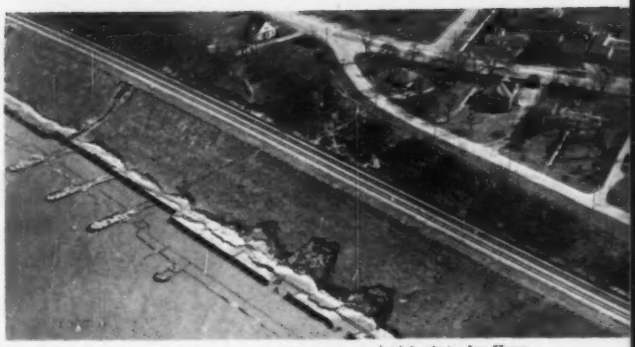
pending on the precipitation on the Great Lakes basin and on the evapo-transpiration losses. Beginning in the early 1940s, rainfall was above average for a 10-year period. By 1952 the Great Lakes were within a foot of the upper limits of their known range of fluctuation. Because the Lakes had not been this high (except for one year) since about 1915, people were accustomed to the lower lake levels. Many buildings, bridges, and highways were built in vulnerable locations and subsequently became victims of severe erosion. Typical examples are shown in the photographs, and it is interesting to note that each shares a common condition—high water level and no dry beach.

Water levels, both in the Great Lakes and in the oceans, may be raised temporarily by wind tides. For example, at either end of Lake Erie wind tides may raise the water level more than 5 feet for several hours at a time. On-shore winds produce the same effect on the oceans, the effect being particularly large in bays and estuaries. The destructive floods in Holland in 1953 were from extremely high wind tides combined with high lunar tides.

Shore Protection Methods

Shore areas can be protected by artificial fill, groin systems, revetments, sea walls, and off-shore breakwaters. Sometimes combinations of these methods are used. The best method for a particular location depends on the severity of the waves and currents, the supply of beach material available, the area's use, and the relative costs of the different methods.

Because a beach is the best possible defense against wave action, restoration of the beach by filling where this is feasible is preferred above all other methods. Filling provides protection while restoring the beach for recreational purposes. Unfortunately, it is limited to regions where low-cost sand is available and littoral currents are mild. Furthermore, this method is successful only where it can be applied to long unbroken stretches of shore line. If the shore area is privately owned in small pieces, unanimous owner agreement can rarely be achieved. This almost limits filling to regions of public ownership.



Aerial photo by Hann

Gaps in offshore breakers let waves eat away the bluffs, endangering the railroad tracks and road.

"Sand bypassing" can provide artificial fill for starved regions on the down-drift sides of inlets. A permanent dredge pumps sand from the up-drift side of the inlet and pushes it through pipes to the down-drift side. A photograph shows an installation of this type with the intake section raised and a portion of the delivery pipe on top of a jetty near Lake Worth, Florida.

Groin Systems

Another method of shore protection that also develops and maintains a beach is a system of groins—short walls projecting into the water from the shore. In locations where there is littoral drift, beach material will collect between groins and establish a beach. Where there is no littoral drift, it is necessary to fill between groins. Combining groins and artificial fill is one of the most effective methods, even under severe conditions.

Groins should be impermeable and perpendicular to the shore line, with the inshore ends extending beyond the uprush of water during high waves or embedded in the bluffs bordering the beach. Groin spacing and length vary with the severity of the erosion conditions. Research on the Great Lakes by the University of Michigan Lake Hydraulics Laboratory indicates that for severe conditions groin length and spacing should be such that squares are formed by adjacent groins, the shore line, and an imaginary line connecting the groin ends. For milder conditions space between groins can be greater.

Groins with a length in the water of from 50 to 80 feet have been successful. Construction mate-

Areas near Brighton without groin protection. The bluff towers 100 feet over the wasted beach below.

rials may be steel sheet piling, concrete, asphalt, timber, rock-filled timer cribs, or rubble. For low-cost construction, timber groins and rock-filled cribs as shown in the photographs are excellent. Rubble, also illustrated, is another successful low-cost method, used extensively on the Florida Gulf coast. In time these groins become virtually impermeable because of extensive marine growths. The same effect could be achieved by using a well-sorted combination of materials.

Revetments and Sea Walls

Where it is absolutely essential to prevent any further damage to an eroding bluff, revetments or sea walls may be used. Sea walls also are used where it is necessary to have deep water at the shore line. Revetments are blankets of stone or concrete placed on and supported by a sloping bank. The only function of a revetment is to prevent scour from waves and currents. Sea walls or bulkheads resist forces of both the waves and back-fill. Materials used to construct sea walls are steel, reinforced concrete, and timber.

Revetments or sea walls should be avoided whenever possible because their presence usually accelerates the erosion process. This is because they do not help dissipate wave energy but, instead, tend to convert it into increased turbulence and faster currents. This action is most severe for vertical walls and least severe for revetments having a mild slope. Only by constructing groin systems along with revetments or sea walls can beaches be maintained seaward of such structures. And groins are less effective used with sea walls than when used alone.

The tendency for erosion to continue in front of such structures must be considered in their design. A trench for the toe of the revetment should be dug to a depth greater than the anticipated erosion. Similarly, sea walls must be designed to withstand the larger forces from waves and backfill that occur after additional erosion has taken place. Design details of such structures are described in the papers listed in the bibliography.

Offshore Breakers

Another effective method of preventing shore damage is with offshore breakwaters paralleling the shore line. Such structures usually are placed in deep water. Because of the reduced wave action in the lee of the breakwater, littoral drift is intercepted and a seaward projection is formed in the shore line. This projection acts as a groin which, in turn, helps collect more beach material. Sometimes this process continues until the beach bridges the gap between the breakwater and the original shoreline. In most locations this would be undesirable because such complete interception of littoral drift is likely to create serious erosion on the downdrift side. The uncertainty about how much sand will be deposited is one disadvantage of this method.

The most serious limitation, however, is the excessively high cost. Whether or not an off-shore breakwater will be effective in a particular location requires careful study of waves and currents. Frequently it is necessary to make a hydraulic model study to determine the best location, orientation, and length.

Breakwaters may be constructed of rubble, concrete, steel, timber, or combinations of these materials. Rock-filled cells or cribs have been used extensively in breakwater construction. Walls of the cells may be of timber, concrete, or steel.

Design Critera

The forces which must be resisted by shore structures are those produced by waves, currents, ice, and, for sea walls, the back pressure of the earth on the landward side. The characteristics of deep water waves can be predicted from the relationships between wind velocity, wind duration, and fetch. The height and orientation of waves change as the waves enter water having depths less than half the wave length. Wave characteristics at the site of proposed shore structures can be determined by refraction diagrams. Breaker location and height can be determined from observed relationships.

Having determined wave characteristics at the proposed structure, the next step is to complete the magnitudes of the resulting forces. Analytical methods of estimating wave forces have been developed and improved during recent years. Laboratory studies and field investigations have supplied some of the empirical coefficients needed for the application of analytical methods. However, so many variables are involved and so broad are their ranges of variation that neither the theory nor test data cover all possible conditions. Many problems still must be solved by model tests. The accompanying references give detailed discussions of wave characteristics and wave forces. ▲▲

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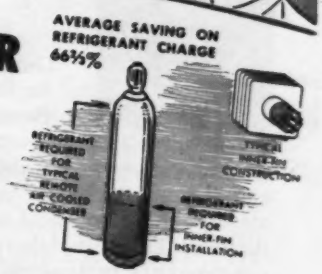
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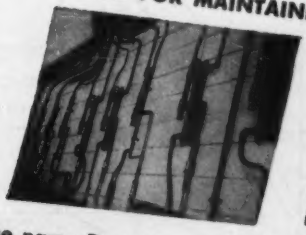

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E. ALFRED PICARDI
Bellman Gillett Richards

Graduating with a B.S. in civil engineering from MIT, E. Alfred Picardi worked in Boston as a structural engineer designing bridges and processing plants. During the war he was with the army engineers. At present Picardi is an associate and chief structural engineer of Bellman Gillett Richards, Toledo architectural-engineering firm. He is registered as a professional engineer in six states, holds NSPE membership, is president of the Toledo ASCE section, and has written numerous articles about structural engineering.

A Graphical Approach to Preliminary Design

IN THE DESIGN of large area buildings, such as manufacturing plants or warehouses, client satisfaction often is measured in terms of pennies saved for each square foot of space provided. This measurement usually is based on a comparison with the cost of other similar buildings with which the client is familiar. Confronted by such a cost-conscious client, the consultant must provide the desired usable floor area at minimum cost, while still offering sound engineering and the hope for reasonably low maintenance expense.

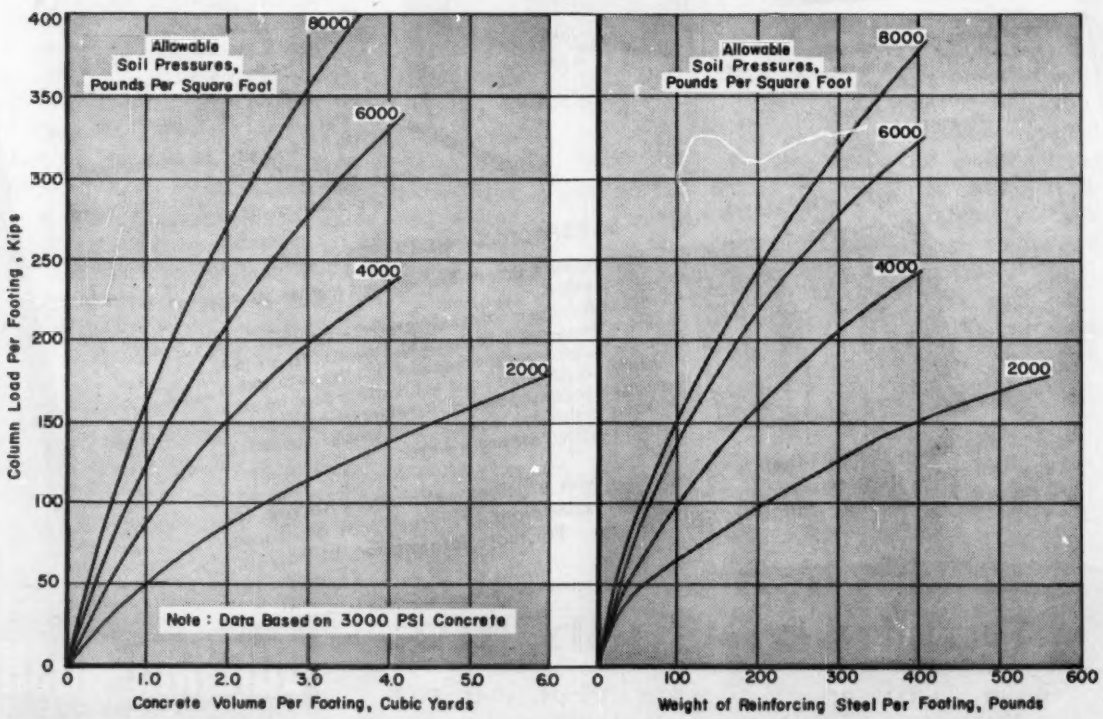

Fig. 1 — Concrete volume and weight of reinforcing steel compared to column loads for spread footings.

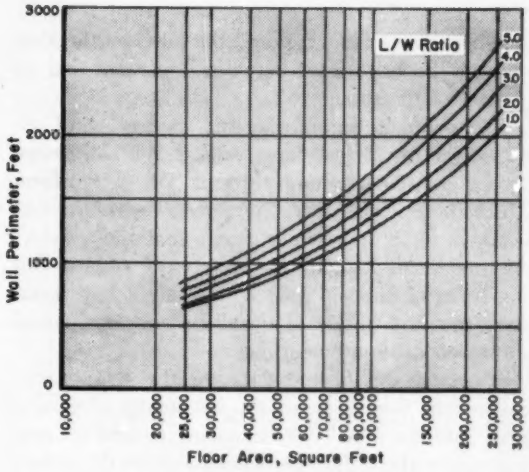

Fig. 2 – Perimeter compared to floor area of a rectangular building, using various length-width ratios.

The most important cost-saving period of any project is the preliminary planning stage. The role of the consulting engineer at this time is to assure a good but minimum cost design. To do the best job possible, he must be called in early so that he can evaluate, from an engineering point of view, the available sites. He must be able to select the best location on the basis of such factors as foundation requirements, grading and drainage costs, transportation facilities, and available utilities.

Along with these studies, he also should recognize at this preliminary stage the effect on building cost of variations in the exterior length to width ratio, variations in size and shape of interior bays, and variations in structural designs.

No Guesstimates

However, the reports and recommendations coming out of these preliminary studies must be more than educated guesses if the consultant is to consistently produce economical designs. He should be able to make rapid analyses in sufficient detail to permit application of unit costs. In this way he can arrive at an accurate indication of the cost variations among the alternate possibilities.

For example, assume that two sites are substantially identical in all respects except subsoil allowable contact pressure under footings is 2000 pounds per square foot at one site and 6000 pounds per square foot at the other. The consultant must make an approximate design for the footings and, from his knowledge of the quantities of materials required and their unit prices, compute an accurate estimate of foundation costs. However, the great number of variables in any building design mean the consultant either will have to carry out many preliminary design and quantity surveys of this type or obtain accurate data from some other source.

Graphs Help

Graphical data, as are shown in Figs. 1 to 4, greatly facilitate the preparation of material quantity surveys for cost comparisons during the preliminary planning stages of a project. Curves of this type can be prepared for most of the important variables in cost analysis although not all of the pertinent variables can be expressed so simply. Accumulation of a substantial file of curves dealing with many variables can be a significant timesaver.

Fig. 1 shows concrete volume and weight of reinforcing steel versus column loads for square spread footings on subsoils of different carrying capacity. With column loads computed from preliminary layouts and allowable soil bearing pressures obtained from soil exploration borings, the approximate quantities of concrete and steel required for footings can be determined quickly from

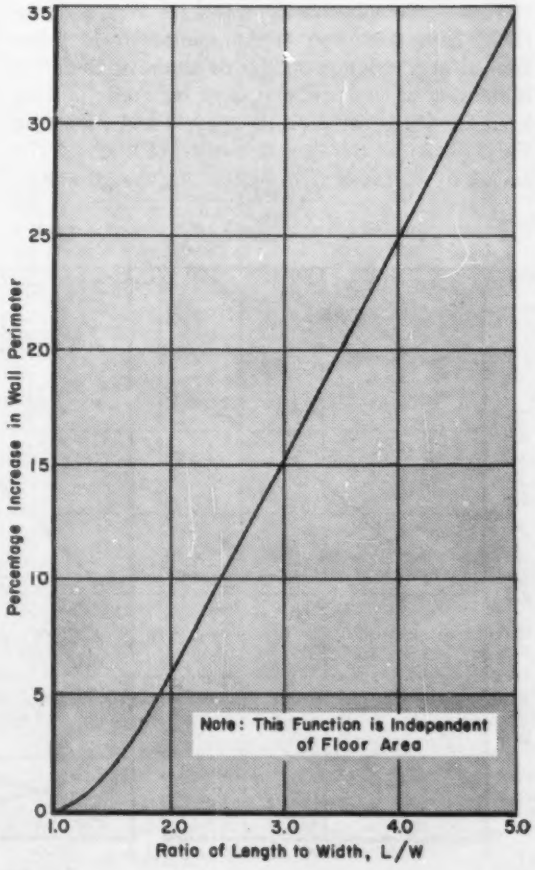

Fig. 3 – Percentage of perimeter increase as the building length-width ratio varies from 1 to 5.

these curves. The curves also can be used to make rapid determinations of the effect on footing cost resulting from the higher column loads of a concrete superstructure compared to one of steel.

Curves showing exterior wall perimeter versus floor area for rectangular buildings with varying ratios of length to width are shown in Fig. 2. Fig. 3 shows the percentage increase in exterior wall perimeter as the ratio of length to width of the building varies. These curves can be used to compute the difference in cost of exterior walls as length to width ratio of the proposed building is varied. Fig. 3 illustrates clearly the effect on wall perimeter of high ratios of L/W which will result in almost a proportional corresponding percentage increase in costs of wall construction. This curve is independent of the floor area of the building.

The curves giving weight of steel superstructure versus bay area for various ratios of bay length to width are shown in Fig. 4. They give quick estimates of girder, column, and joist weight per square foot of floor area for a common type of simple steel building frame.

These curves are based on designs for typical interior bays consisting of continuous steel girders framed over columns in the direction of the short dimension of the bay, and steel bar joists or long span joists supported on the girders and framed in the direction of the long dimension of the bay. The saving in weight of steel by framing the girders on the short span of the bay and the joists on the long span of the bay varies between 2 percent and 10 percent of the total.

The columns supporting the girders were assumed to be 24-feet long, and 8 WF 24's were used as minimum column sections. The design from which these curves were computed assumes a roof live load of 25 pounds per square foot and a superimposed dead load of 10 pounds per square foot consisting of built-up roofing, insulation, and metal deck, plus the weight of sprinklers and mechanical and electrical equipment.

A comparison of the data for the L/W ratios covered in Fig. 4 shows the advantage of square bays, and the penalty in increased weight of steel that comes about through departure from the square bay can be quickly computed.

Prepare Your Own

These curves may be prepared for various other types of steel and concrete roof framing systems for interior bays, for different types of wall construction, and for many of the other common variables in materials and dimensions.

They are extremely useful in preliminary cost analyses of the common warehouse and industrial or commercial building project, and they will enable the consultant to give accurate recommendations quickly during the preliminary stages of project development. ▲▲

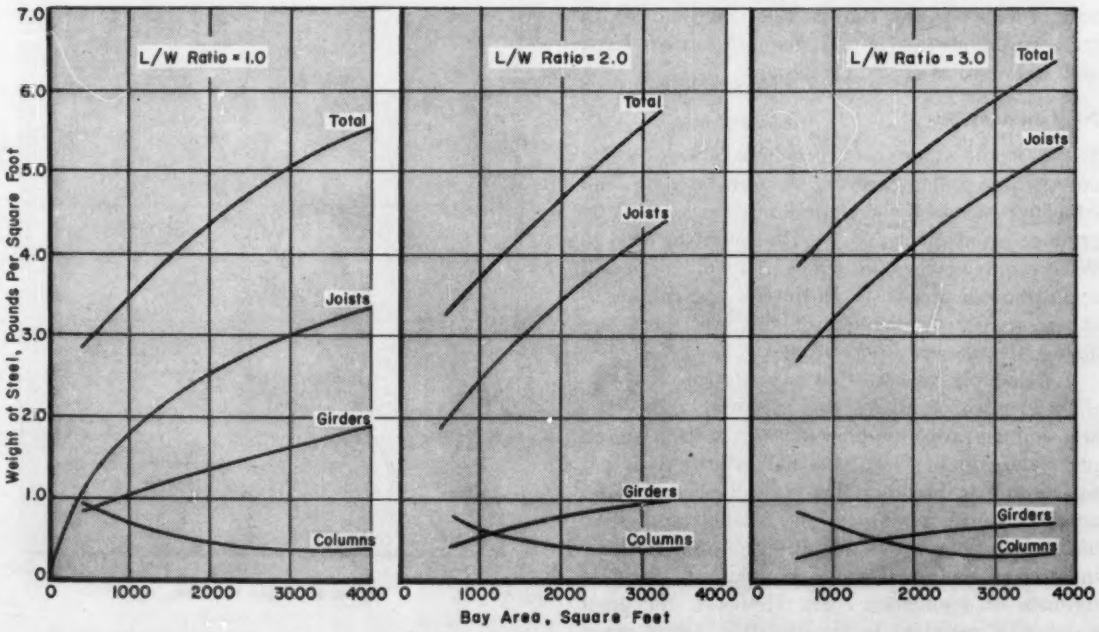

Fig. 4 — Weight of steel superstructure compared to building bay area for various length-width ratios.

A Simpler System

For Assembling Specifications

HARRY TERRY
Consulting Engineer

Page 2

SPECIFICATIONS

Job Wilmington Brownell Chapel Date Jan. 20, 1958

Work Heating, Ventilating + Air Conditioning

Paragraph		Copy Paragraph		
No.	Title	No.	Job	Remarks
11	Operating and Maintenance Instructions	10	Trenton Chapel	
11(a)		10(a)	" "	
11(b)		10(b)	" "	
11(b)(1)		10(b)(1)	" "	
11(b)(2)		10(b)(2)	" "	
11(c)		10(c)	" "	Including "Table of Contents"
12	Performance Requirements	5-12	Pageuise	
12(a)		5-12(a)	"	
12(b)		5-12(b)	"	
12(c)		5-12(c)	"	As corrected
13	Guarantee	12	Trenton Chapel	
13(a)		12(a)	" "	
13(b)		12(b)	" "	
14	Description of System	14	See Yellow Sheet	
14(a)		14(a)	" " "	
14(b)		14(b)	" " "	
15	Air Conditioning Units	5-14	Pageuise	
15(a)		5-14(a)	"	As Corrected
15(b)		5-14(b)	"	
15(c)		5-14(c)	"	As Corrected
15(d)		5-14(d)	"	" "

This form is filled out by the engineer and given to the typist to guide her in typing a set of specifications.

A VERY IMPORTANT PART of designing mechanical and electrical systems for buildings is writing the specifications needed to accompany the drawings. Most consulting engineers write the specifications themselves or review and approve work done by the designers on their staffs.

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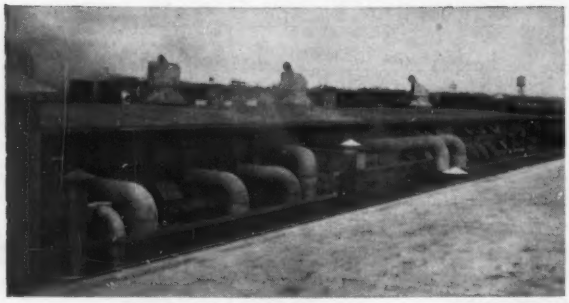
Where there is little uniformity in the skill and experience of bidders (as in Federal or state work) specifications must have all requirements carefully explained; for private work, where screening of bidders is common, specifications can be less wordy and yet give all the necessary information for experienced contractors to follow from start to finish.

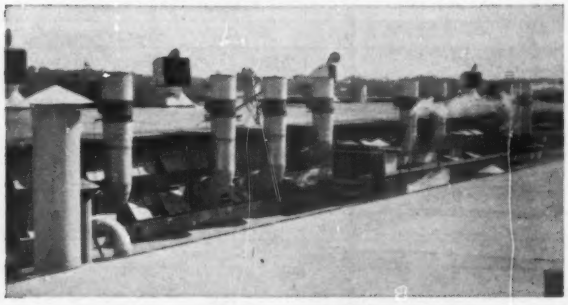
There has been little published about standardized editorial content and proper format and too little discussion and too little agreement on what constitutes a satisfactory electrical or mechanical specification. To learn what manufacturers and contractors might suggest to improve specifications for mechanical and electrical work, I wrote 50 associations, asking each for standards that might be referred to in simplified specifications. The answers were discouraging.

Members of trade associations are interested in advertising distinctive features of their own prod-

the downturn



and upturn at KVP



Same picture – different setting. Top shows complicated, space-wasting duct system which routed fumes back into plant for discharge through stacks. Bottom shows nine new 36" Aerovent "SP-7" Duct Fans installed to take fumes *up* and *out*, saving valuable floor space in busy working area. Just one of hundreds of successful Aerovent installations characterizing modern air engineering in action.

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ucts and not in simplified generic specifications. Many manufacturers do publish suggested specifications for their products—but almost without exception they are unnecessarily detailed and must be heavily cut for use in consulting engineer's specification work.

Dangers in Using Previous Specifications

For the consultant, one way to write specifications is to mark up those used previously. However, such marking eventually destroys the original material. This heavily marked copy, turned over to a typist, is almost impossible to decipher. Sometimes amusing sentences find their way into the final specifications. New York contractors, for example, were dumbfounded when they read that sand and gravel from a local excavation site were to be dumped in the Pacific Ocean. A careless consultant had copied the specifications from a west coast job.

But old specifications can be used provided the necessary modifications in applicable paragraphs are made and required paragraphs added. More important is to give the typist a draft which can be deciphered and transcribed.

A good way to "write" specifications is for the consultant to prepare his own standard paragraphs, kept up to date, as a source file. (See "Standard Worksheets . . . For Tailored Specifications," CONSULTING ENGINEER, June 1958). This eliminates the need for restudy of materials and methods each time a new job specification is to be written. But the assembly and recording of these paragraphs and the preparation of a usable compendium requires more time than many offices care to devote to the problem.

A Simple Time-Saving System

In my office we have devised a very workable system for writing and typing specifications. It can be used for specifications written from paragraphs taken from other specifications yet permits inclusion of newly written paragraphs as well as standard paragraphs.

Using cataloged paragraphs and the illustrated guide form makes specification writing and typing less confusing and faster. In a page or two the guide form presents a brief of an entire specification as well as an excellent checklist of the contents. It assures inclusion of all essential information the specification should contain, eliminating the necessity for later addenda.

For the typist the form assures clear instructions and an easily read draft to be copied. Furthermore, modifications, new information, or other changes in the specification draft can be easily noted on the guide form at any time. We have found this very convenient. ▲▲

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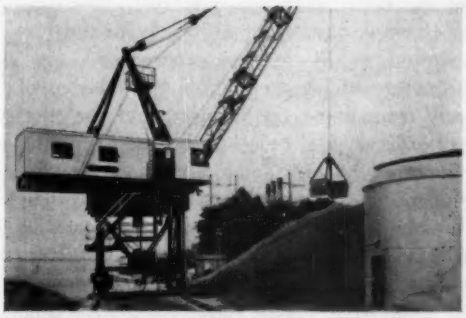

Self-propelled Clyde Whirley unloading from barges to stock piles and storage bins along river site.

Barge mounted Clyde hoist and derrick handling coal from barges to conveyor hopper for distribution to cars and trucks.

1 CLYDE UNLOADERS

Clyde Unloaders . . . the finest, most modern machines for high speed handling of bulk materials from barges or ships direct to distribution hopper in tower. Unloader can be equipped with self-propelling trucks or be stationary mounted. Three standard sizes with free digging capacities up to 1200 tons per hour.

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Clyde Whirleys are specially designed for efficient, economical and fast cycle rehandling of materials. Their long reaching, full-revolving booms permit servicing exceptionally large areas. Materials can be unloaded from barge or ship to stock piles, storage bins or loaded directly into cars, trucks or hoppers.

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Clyde Stiff Leg Derricks powered by Clyde hoists make an ideal combination for low cost, heavy duty material where degree of swing is limited. Anti-friction bearings on Clyde hoists and derricks reduce friction losses, save maintenance costs and permit heavier pay loads to be handled with less power consumption.

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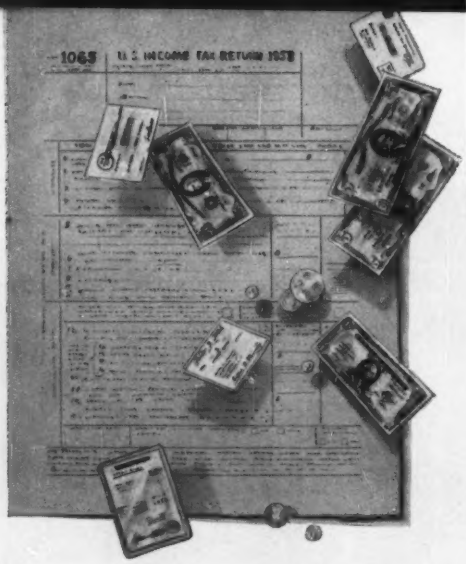

Credit Cards & Cash ...New Tax Regulations

CARL H. RISTAU, C.P.A.
Kovtan & Ristau

TRAVEL AND ENTERTAINMENT deductions and your expense account became a much discussed topic last year. The Internal Revenue Service intensified both its drive on expense account abuses and publicity of its proposed activities.

CE exclusive

Recently the Internal Revenue Service published its new regulations governing this matter. Line 6a ("Less travel, reimbursed expenses, etc.") or a counterpart probably will appear on the 1958 and subsequent individual income tax forms. However, it will not mean the same to everyone.

Experts recommended last year that employers require employees to account to them for all cash expenses and then reimburse the employees in accordance with their accounting. The new regulations look upon credit cards as the equivalent of cash allowances. Hence, employees should account for all usage of credit cards.

According to the Bureau of Internal Revenue regulations, to "account" to the employer means "to submit an expense account or other required written statement to the employer showing the business nature and amount of all the employee's expenses (including those charged directly or indirectly to the employer through credit cards or otherwise), broken down into such broad categories as transportation, meals, and lodging while away from home overnight, entertainment, and other business expenses." Casual slips or lumping of expenses will not do; nor may credit cards be grouped as a separate item. All charges must be broken down under the required headings.

How to Report on Tax Return

Assuming the employee must account to his employer, he reports on his tax return as follows:

¶ Where his reimbursement equals the expense, he need only state in his return that the total of amounts charged directly or indirectly to his employer through credit cards or otherwise and received from the employer as advances or reimbursements did not exceed the ordinary and necessary business expenses paid or incurred.

¶ Where reimbursement exceeds expense, he must include the excess as income and state on his return that he has done so.

¶ Where expense exceeds reimbursement, he may make the statement required by the first paragraph unless he wishes to claim a deduction for the excess. To secure a deduction, he must submit a statement showing the following information as part of his tax return:

1. The total of all amounts received as advances or reimbursement from his employer, including amounts charged directly or indirectly to the employer through credit cards or otherwise

2. The nature of his occupation, the number of days away from home on business, and the total amount of ordinary and necessary business expenses paid or incurred by him (including those charged directly or indirectly through credit cards or otherwise), broken down into such broad categories as transportation, meals and lodging while away from home overnight, entertainment, and other expenses.

Hence, employees whose reimbursements equal or exceed their expenses are relieved of duplicate record keeping or detailed reporting. The employers' records satisfy all the requirements.

Who Must Substantiate Deductions?

The regulations set forth four classes of taxpayers who will be called upon to substantiate expense account information:

¶ A taxpayer who is not required to account to his employer or who does not account

¶ A taxpayer whose expenses exceed the total of amounts charged to his employer and amounts re-

ceived through advances, reimbursements, or otherwise and who claims this as a deduction

¶ A taxpayer who is a sole proprietor, partner, or a controlling stockholder-employee, or brother, sister, spouse, ancestor, or lineal descendent of such a principal of a firm

¶ Other taxpayers where it is determined that the accounting procedures used by the employer for the reporting and substantiation of expenses by employees are not adequate

Credit Cards Equal Cash

The general record keeping system used in the past and approved by the Internal Revenue Service (see "Entertainment, Travel, and Your Income Tax," CONSULTING ENGINEER, September 1957) is appropriate for substantiating records except that credit card payments now must be considered the same as any other cash payment.

An excerpt from the regulations indicates what is meant by the term *acceptable records*. "One method of substantiating expenses incurred by an employee in connection with his employment is through the preparation of a daily diary or record of expenditures, maintained in sufficient detail to enable him to readily identify the amount and nature of an expenditure, and the preservation of supporting documents, especially in connection with large or exceptional expenditures. Detailed records of small expenditures, for example, tips, incurred in traveling or for transportation will not be required."

Fixed Allowances Permitted

These regulations also provide that the commissioner at his discretion may approve reasonable business practices under which mileage, per diem in lieu of subsistence, and similar allowances providing for ordinary and necessary business expenses in accordance with a fixed scale may be regarded as equivalent to an accounting to the employer.

September 15, 1958 the commissioner ruled that a fixed mileage allowance or per diem allowance in lieu of subsistence at rates not in excess of 125 percent of the rates authorized to be paid by the Federal government in the locality the travel is performed will be deemed to be the equivalent of an accounting to the employer. (Within the continental United States, acceptable mileage rates are not in excess of 12½ cents a mile and per diem not in excess of $15 per day.)

Consulting engineers with employees traveling outside the continental United States should refer to Standardized Government Travel Regulations, Appendix I, Revised – Maximum Per Diem Rates in Lieu of Subsistence for Travelers Beyond the Limits of the Continental United States – to determine the acceptable rates. ▲▲

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Report From Switzerland

DR. CARL HANNS POLLOG

Messrs. Gruner Brothers, of Basel, were consulting engineers for this new office building recently completed for I. R. Geigy AG, chemical manufacturers.

SWITZERLAND is politically and economically unique. In politics, Switzerland's everlasting and unconditional neutrality is anchored in the Swiss federal constitution and has been guaranteed by most foreign powers. Since the Napoleonic wars the country has not seen any armed conflict, except a civil war of scarcely a fortnight's duration in 1847.

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While more than a century of internal and external peace undoubtedly constitutes a record, the economic situation of Switzerland is also noteworthy. This is a small country, smaller than New Hampshire and Vermont combined, high in the Alps, nowhere bordering the sea, with virtually no natural resources except waterpower; in spite of these handicaps Switzerland has become a highly industrialized nation.

Engineering has special importance in the nation's economic life, and Swiss engineering activity is scarcely less world-wide than the market for its products.

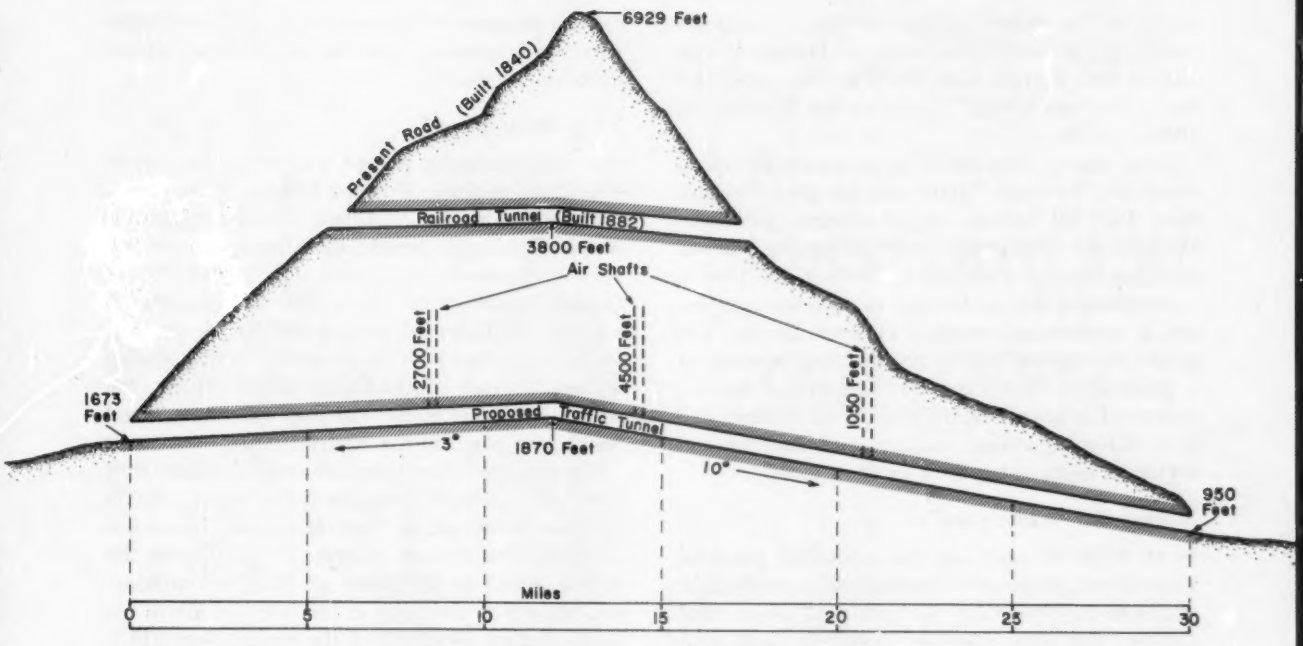
Swiss engineers and architects are trained at the Federal Institute of Technology at Zurich or the University of Lausanne Institute of Technology. Having passed the examinations the student becomes a *diplom ingenieur* or *diplom architekt*. The Swiss Association of Engineers and Architects (SIA) admits only engineers with a proper professional education, so membership is equivalent to semiofficial recognition of the title. Diplomas of officially recognized foreign technical schools also are acknowledged. The SIA currently is headed by Georg Gruner, partner in the Basel firm of Gruner Brothers.

Many consultants also are members of the Association Suisse des Ingenieurs-Conseils (ASIC), affiliated with the Federation Internationale des Ingenieurs-Conseils (FIDIC). A. Eigemann, a consulting engineer of Zurich, is president of this group, made up solely of engineers in private practice.

Like engineers in other countries, the Swiss consultant does engineering planning, designing, and supervising of construction. Machine design, however, is generally done by a manufacturing firm's own engineers with consultants occasionally commissioned for independent inspection.

A Strict Ethical Code

Professional ethics demands that the Swiss consulting engineer consider himself the trustee of his

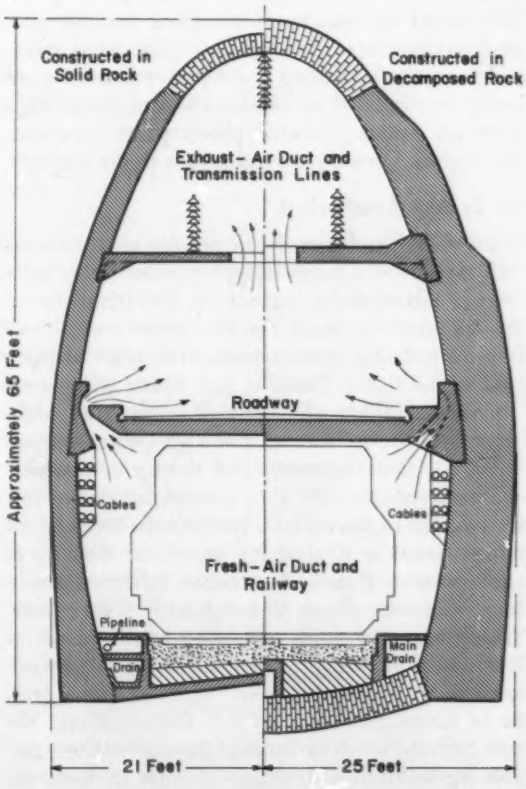


Sectional view of mountain shows San Gothard post road, railroad tunnel, and proposed European divide tunnel.

client. In fact, article 3 of the SIA professional scale of fees stipulates that "the engineer is obliged to safeguard the legal interests of his clients. He shall be independent of suppliers and contractors, from whom he shall accept no payment nor other advantages of any kind. He shall receive payment exclusively from his client." In event of an infringement of this rule the engineer risks exclusion from his professional association.

Fees are calculated on a sliding scale based on the contracting sum, decreasing as the cost of the project increases and increasing with the project's difficulty. All engineering work, from the simplest to the most complicated and specialized, is classified in one of five groups. The fee scale begins at 12.57 percent for a small project of elementary design (class 1) and increases 1.7 percent for each class. Thus, a project of the same size in class 5 (highly specialized professional work) would reach 19.37 percent. At the other limit of the scale—for projects of $5 million or more—the fees range from 2.59 percent for class 1 work to 9.39 percent for class 5 designs.

Percentages may be reduced for more than one project of the same kind and increased when special knowledge (for example, local conditions in a foreign country) or more than average professional skill is required. Fees do not include direct expenses of the consultant, his employees and representatives, wages or expenses paid to personnel in travel-



Cross section of divide tunnel shows dimensions for work in solid and decomposed rock formations.

ing or on the project, special services, or cooperation (e.g., administrative work or lawsuits). Details of such charges were listed in "Fee Schedules for Swiss Consultants," CONSULTING ENGINEER, October 1955.

Swiss income taxes are lower than most European countries. No exact figures can be given because taxes vary by canton and community. Generally the tax rate rises steeply with increasing income. Business expense allowances, however, are liberal.

Switzerland has a shortage of technical personnel, a phenomenon common all over Europe. The graduate engineer can easily find employment at a good salary. Since the war Switzerland has experienced a boom unparalleled in its history, and it is still going strong. Industry and building and therefore engineering have profited greatly.

Mining the "White Coal"

Some 30 or 40 years ago the abundant potential water-power resources of Switzerland were thought ample to supply energy for nearly all continental Europe. But now railroads, industries, and residences have been electrified to such an extent that Switzerland is forced to import coal to generate enough power for its own use and buy electric energy from other countries in the winter. Every possible attempt has been made to replace this imported coal and power by "white coal" from Swiss rivers and torrents. Remaining water-power resources are being developed at an accelerated rate. Swiss engineers are building electric power plants in mountain regions formerly accessible only to the chamois.

No Longer Landlocked

Swiss rivers are being developed for navigation as well as power. Already shipping from ocean ports reaches inland Swiss harbors via the Rhine River. Similar plans are ready for the Rhone and Ticino-Po Rivers. And an interconnection through Switzerland of the Rhine, Danube, and Rhone is planned.

Switzerland has an excellent network of highways, and the roads over the high passes are admired for their ingenuity and daring in planning and construction. But the increase in motor traffic, too, has surpassed all expectations. Switzerland ranks second in Europe for motor car density; in addition more than half a million foreign automobiles enter the country temporarily every year. Therefore, many roads are being improved or relaid, and a project for a national highway network to carry an important amount of international traffic in transit has been set up. Unfortunately, the new highways will be built at the expense of valuable agricultural soil, scarce enough in most regions. The plan would be easier to realize if highways were federal rather than canton affairs, but for this purpose an amendment to the constitution would be necessary, and this would mean an all Swiss referendum.

Three-Story Tunnel

One very interesting project worked out by a Swiss consulting engineer Edward Gruner of Basel is a three-story rail and road base tunnel through the Alpine divide. At present the shortest connection between central Europe and Italy is the 10-mile Gotthard Railway at about 3800 feet altitude. A highway at Gotthard crosses the divide at 6929 feet and is closed for six or seven months during winter, like all other Alpine passes except the Albula-Jlier road in the east and the Brenner and Semmering roads in the Austrian Alps.

The proposed 30-mile tunnel would facilitate both road and rail traffic, especially in winter, for its accesses would not be high in the mountains but at the bottom of main valleys. It would enter the Alpine massif in the north at 1673 feet altitude, and leave it in the south at just 950 feet above sea level. Highest elevation of the tunnel floor (1870 feet) would be 13 miles from the northern entrance, with gradients towards both sides for water run-off. The tunnel would shorten the highway distance some 20 miles and avoid an altitude difference of over 5000 feet. In addition, winter traffic would not be exposed to the rigors of the upper valleys and peaks.

Especially interesting are the three stories. The bottom tunnel level would be a double-track railroad, plus telephone and telegraph cables, drains, possibly pipelines for oil and gas, and a fresh-air duct for the whole construction. The air would be pumped in the tunnel by installations at the tunnel mouths and three vertical shafts, the longest 4500 feet.

The middle story would carry a two-lane road. The top level would contain the exhaust duct, and could also house high-tension lines, which now cross the pass with the road, exposed to snow and avalanches.

The original Gotthard railway tunnel was subsidized by the Swiss, Italian, and German governments. The proposed new tunnel could be built with private capital, provided tolls could be collected from motor traffic. But this would raise a legal question, because Swiss law prohibits road, bridge, or tunnel tolls. The tunnel might attract international capital, for even through the political and economic conflicts of the last decades, devaluation of the Swiss franc has been less than that of any other currency. Economic advantages of the tunnel would be enormous. It would be an outstanding engineering work and certainly a great tourist attraction. ▲▲

Ethics, Law, and Registration

JOSEPH WEIL, Dean
College of Engineering
University of Florida

TOO MANY consulting engineers do not distinguish the difference between ethics and law. Based upon many years of experience as a member of a state board of engineering examiners, I have come to the conclusion that frequently engineers in private practice expect the board to investigate, prosecute, and pass sentence in event of violations of either ethical codes or legal statutes.

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Scope of Registration Boards

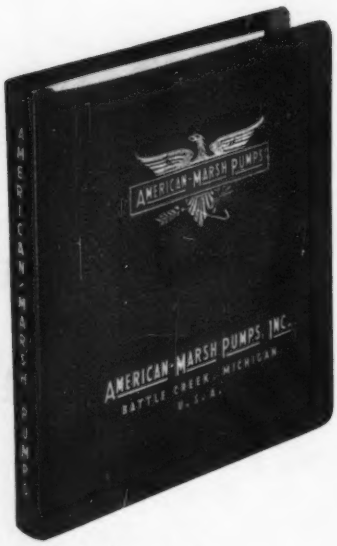
Engineers must learn that in practically every state the prime purpose of the registration board is to determine the qualification or lack of qualification of applicants who wish to practice their profession. The medical boards do not seek out nor judge infractions of either law or ethics pertaining to the practice of medicine. Few of the legal examining boards of the professions have this responsibility. In medicine, matters pertaining to legal law enforcement are handled through the regular police powers of the state, and matters involving infraction of ethical considerations are handled through the professional societies. In the legal profession the local and state bar associations normally handle infractions of rules of ethical practice, and they assist the state legal authorities in prosecuting violators of the law.

The board's action, whether a medical, legal, or engineering board, usually consists of the determination of whether or not a person has been properly qualified to practice his profession. Even this is subject to review by a court. It is not part of American ideology to have judge, jury, prosecutor, investigator, and policeman in the same entity. Yet, this appears to be the position that some professional engineers would like to have their registration boards adopt.

Qualifications for Practice is Main Role

The engineering registration boards in the main are interested in determining the qualifications of applicants. If there is someone practicing engineering as a professional engineer and he is not regis-

This Catalog offer repeated for those who did not order earlier this year.



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tered, then this should be reported to the board. They can take action, through a court if necessary, to stop the unregistered engineer from offering his services to the public.

If a registered engineer is breaking a law pertaining to the practice of engineering, then he should be taken to court, not to the registration board. In bringing a lawbreaker to court, the state and national engineering societies should be expected to assist on the case.

Ethical infringements are the responsibility of the engineering societies. Neither the registration boards nor the courts have any rights nor responsibilities in regard to ethical infractions.

Engineering Registration a Late-Comer

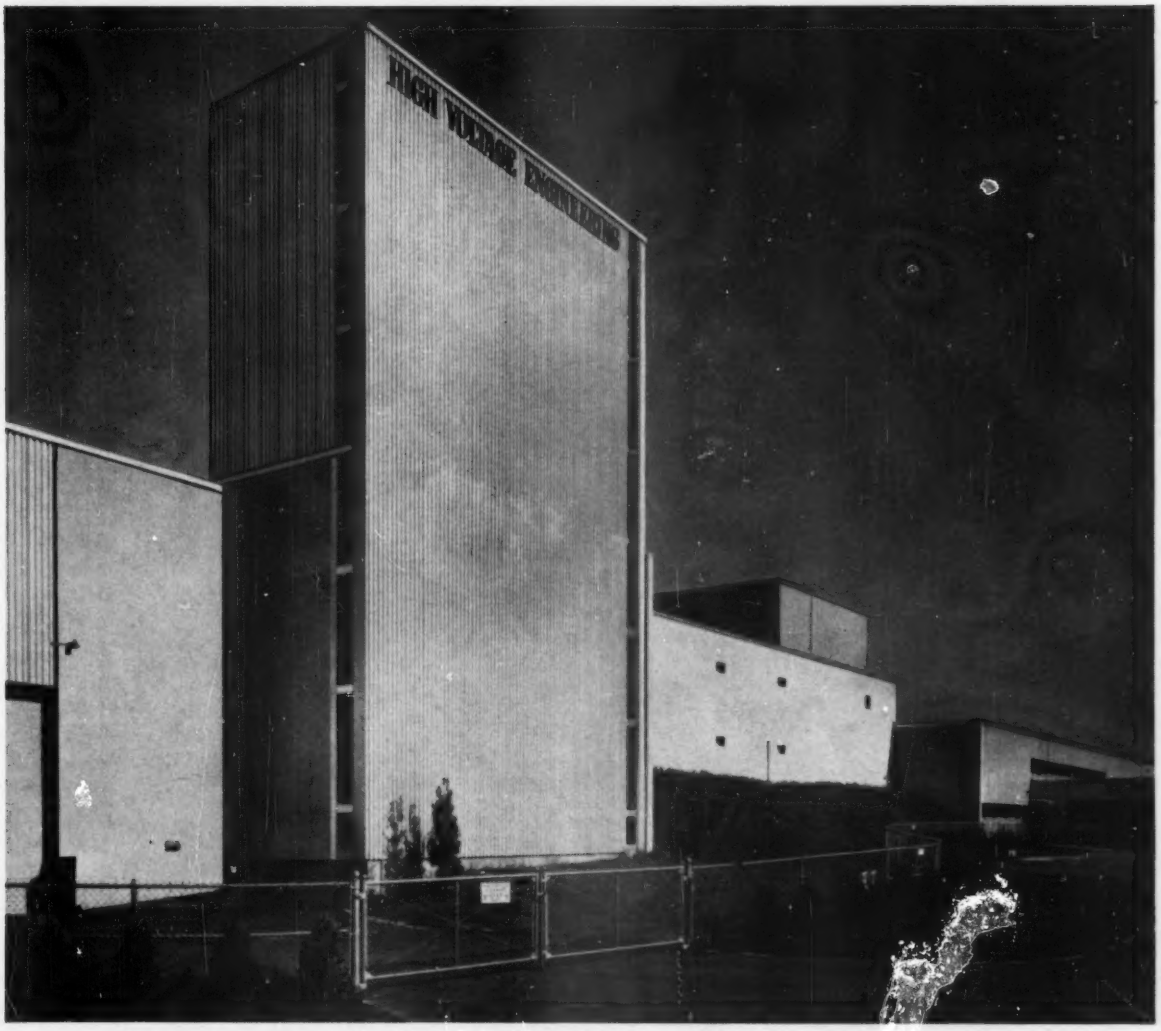
Perhaps much of the misunderstanding originates from the fact that of all the professions, engineering is the newest. There have been licensing laws in medicine since 1700, in dentistry since 1841, in law since 1890, but the first engineering registration law was not passed until 1907. Perhaps it is because of the newness of our registration laws that there is such a strong attempt to shift responsibility for acting on legal and ethical violations directly to the board of engineering examiners.

Then too, there is no one engineering organization to which engineers are accustomed to turning for legal aid and ethical judgment. Many of the societies have taken some action in these matters—few have taken much. Left nowhere to turn with confidence, the engineer goes to his registration board—only to have it point out its limited field of action.

Good Code of Ethics is Important

It is important for every profession to have a good code of ethics. Medicine and law have excellent codes, fully backed up with published case histories and examples. Engineers have codes, too, and it is important that they be fully interpreted and carefully enforced, but that is the job of the societies, not of the registration boards and the courts. It is, in my opinion, essential that the accepted codes be enforced and that those who fail to abide by them be punished. The punishment would be suspension or revocation of his membership in engineering societies and the contempt of his ethical colleagues in the profession.

We can only hope that the day is not too distant when professional engineers, as good citizens, and their societies will fully accept the responsibility for policing and enforcing their own codes of ethics and will not expect of either the registration boards or the courts that which they are not permitted to do under the law. We must understand the difference between law and ethics. ▲▲



Partial View of the new plant on a 50-acre tract.

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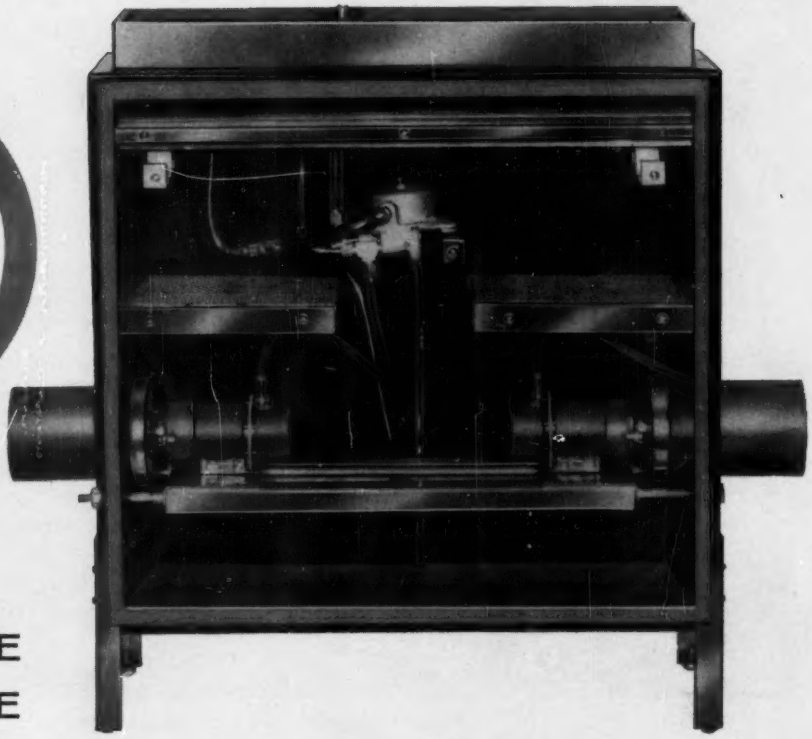

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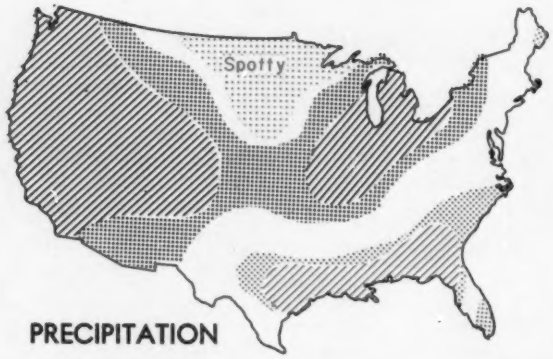
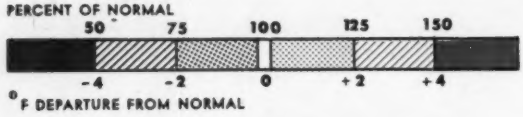
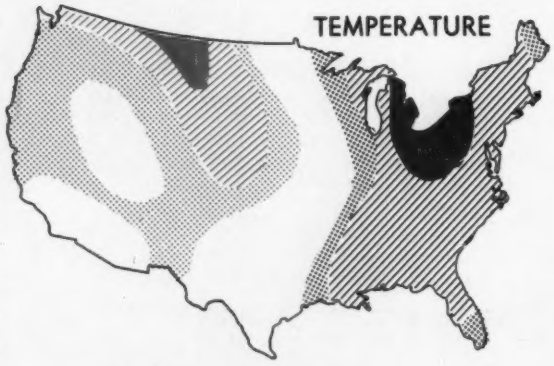
DECEMBER 1958

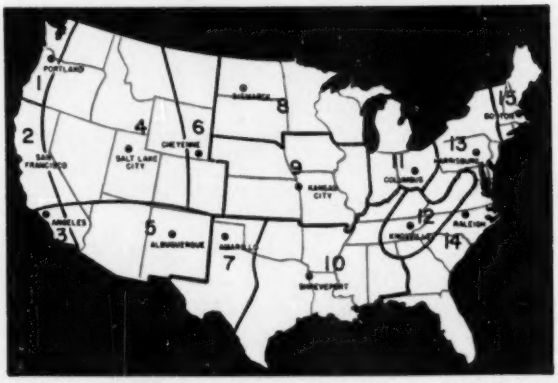
Prepared Exclusively for CONSULTING ENGINEER



PRECIPITATION







CONSTRUCTION DAY FORECAST LOCATIONS

CONSTRUCTION DAY CRITERIA

To be considered a construction day on these charts, the day's maximum temperature must be more than 38 degrees. There must be less than six inches of snow on the ground. There must be less than six hours of active precipitation between the hours of 7 a.m. and 5 p.m. There can be no more than one inch of rain on the preceding day.

DECEMBER HIGHLIGHTS

With the exception of the deep south states bordering the Gulf of Mexico, a relatively dry December may be expected over the United States. Most of the southeast will experience much above normal rainfall for the month with the precipitation band extending through southeastern Texas, up into Alabama and mid-Mississippi, and continuing eastward through lower North Carolina. The area west of the Great Plains, extending through the Rockies to the Pacific Coast, and the Great Lakes region are expected to observe much less than normal precipitation this December. The trend toward warmer than normal weather will continue in the west with average temperatures ranging from near seasonal to more than 4 degrees above normal in some sections. It will be colder than normal from the Great Lakes region to the East Coast with cold weather extending southward to the Gulf Coast sections, including Florida and most of the deep south. Temperatures should average more than 4 degrees below normal in that much of that section. It is important to note that although warmer than normal temperatures are expected over much of the western half of the country in December, this does not imply that freezing weather will not occur. Frequent intervals of below zero weather should be observed over most of the northern and eastern sections of the country. Even in some sections of the southeastern and southwestern United States, temperatures may be expected to dip into the 20's and lower 30's.

TEAR OUT ALONG PERFORATION.

These forecasts are prepared by Irving P. Krick Associates, Inc., the world's oldest and largest weather engineering firm. The forecasts are based on methods developed by this group at California Institute of Technology prior to World War II. After the War, the methods were adapted to high speed electronic computing machines to shorten the time required to solve the complex problems of the atmosphere. Ultra-long range forecasts, up to a year or more in advance, are now available. Information on other Krick weather services is available by writing to the home office of the firm at 460 South Broadway, Denver, Colorado.

CONSTRUCTION DAYS

DECEMBER 1958 ESTIMATES															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	26	30	31	22	31	25	29	11	25	29	22	28	20	29	21
LOWEST	12	21	26	8	21	11	21	2	10	22	5	17	6	13	7
AVERAGE	20	26	29	15	25	18	26	5	17	26	13	22	13	24	15
ESTIMATE	24	28	30	18	29	23	27	4	18	24	8	18	8	18	11

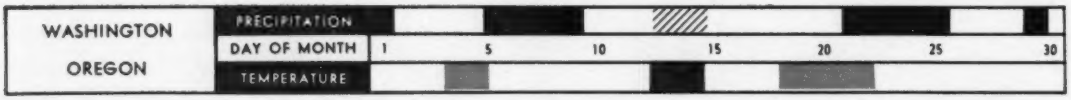
These estimated construction days for key cities in the United States should be interpreted as an average of estimated conditions over the forecast area. To obtain the best results, the forecast number of construction days should be compared with the temperature and precipitation anomaly maps and the timing estimates to determine the probable number of construction days in your locality. The forecast construction days are based on average construction day requirements as defined under "Construction Day Criteria," and should be adjusted for individual operations.

JANUARY AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	30	30	31	24	31	26	30	15	31	29	16	28	23	29	16
LOWEST	4	20	23	0	16	1	13	0	8	18	1	15	1	18	2
AVERAGE	16	27	28	11	24	16	23	5	16	24	11	22	14	24	10

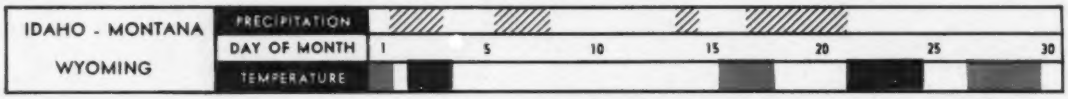
FEBRUARY AVERAGE AND RANGE*															
LOCATIONS	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15
HIGHEST	26	27	28	23	29	23	29	10	26	28	22	26	24	28	15
LOWEST	10	22	21	7	21	8	20	0	9	18	5	15	10	19	8
AVERAGE	20	25	25	18	26	14	25	3	17	24	14	22	15	24	11

*Historical Average, Not a Forecast

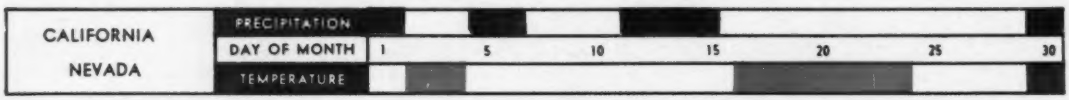
DECEMBER 1958 TIMING OF



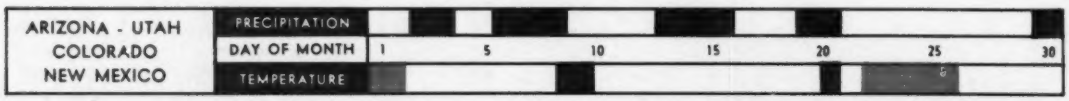
December is expected to be drier than normal throughout this area. Scattered but important snowfall is expected to accompany the major cold air outbreak around mid-month. Average monthly temperatures should range slightly above normal.



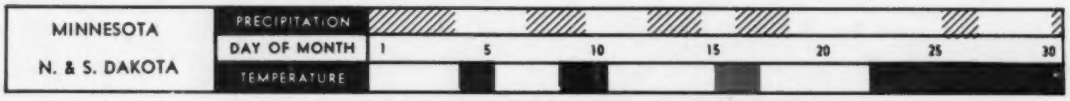
The storminess indicated around the 2nd should bring the heaviest precipitation in southeast Wyoming, while around the 20th important precipitation is expected east of the Divide. Look for below zero temperatures on several days around the 22nd of the month.



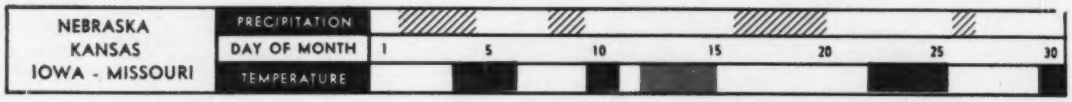
Showers during the first day or two of the month should occur in Nevada and the higher mountains spreading into upper and central California around the 5th. Unseasonably cold temperatures should be expected in Nevada around the 14th.



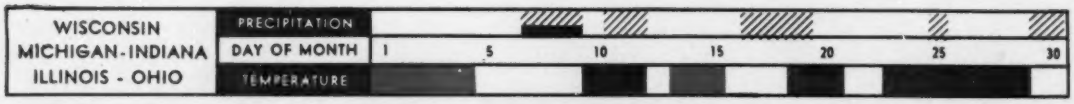
A dry December is in prospect for this area. Important precipitation should occur during the first 15 days of the month. The storminess indicated for around the 20th should be confined to northern Utah and Colorado.



Storminess during the first of the month should be more important in the southern sections, with temperatures expected to drop below zero during the indicated cold intervals. Considerable snowfall should be experienced during the month.



The first ten or twelve days of the month should be accompanied by important and frequent snowfalls in this area. Temperatures are expected to drop below zero for several days during the cold interval indicated at around the 10th of the month.

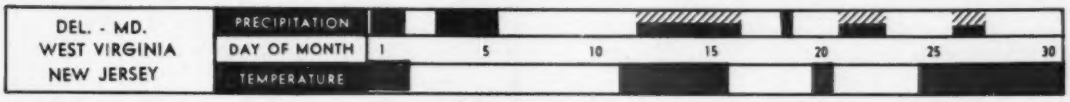


Storminess indicated around the 8th should move into the southern half of this area and continue generally over the Great Lakes region. Below zero temperatures are expected to be quite common during the last half of the month.

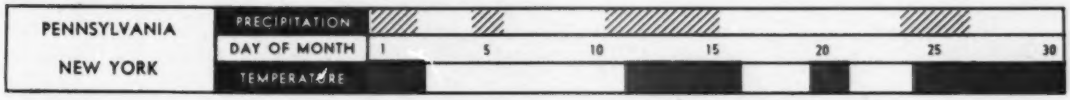
F SIGNIFICANT WEATHER EVENTS

RAIN
SNOW
WARM
COLD

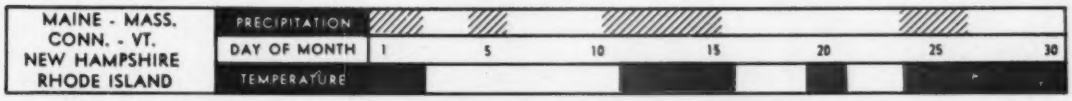
The timing bars below are intended to indicate periods of important general storminess and important departure from temperature normals in areas indicated. They are highly accurate over the area indicated, but are too general to pinpoint small local storminess or showers. Allow one day on either side of indicated storm or extreme temperature periods for general planning. Combination rain or snow shading indicates either one or both.



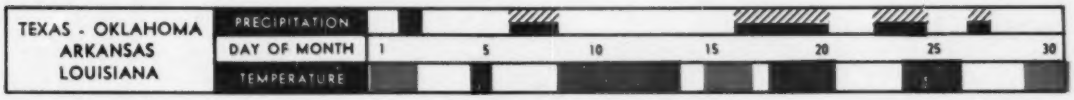
A colder than normal month is expected for this area with low temperatures dropping frequently to near zero. Important storminess should be centered on several days during the period indicated around December 12th or 13th.



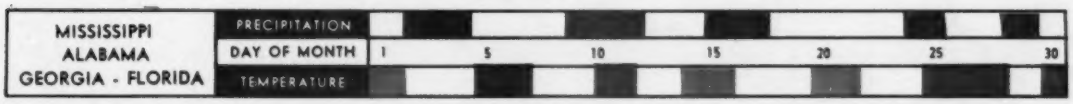
A much colder than normal December is in prospect this year with frequent near zero temperature readings anticipated. A prolonged interval of unsettled, stormy weather should be expected in this region between the 10th and 15th of the month.



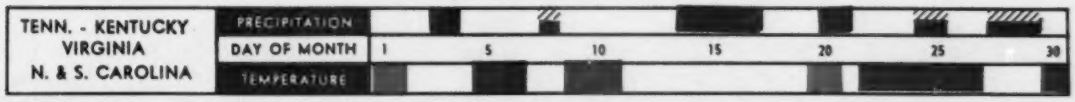
Unseasonably cold weather is anticipated this December. Most of the precipitation should occur during the first half of the month. However, the storminess indicated for around the 25th will be followed by several days of unusually cold weather.



Near to slightly less than normal precipitation is expected this December in this part of the country. Low temperatures should drop into the 20's during the indicated cold intervals with 5 to 10 degree readings in many of the northern sections.



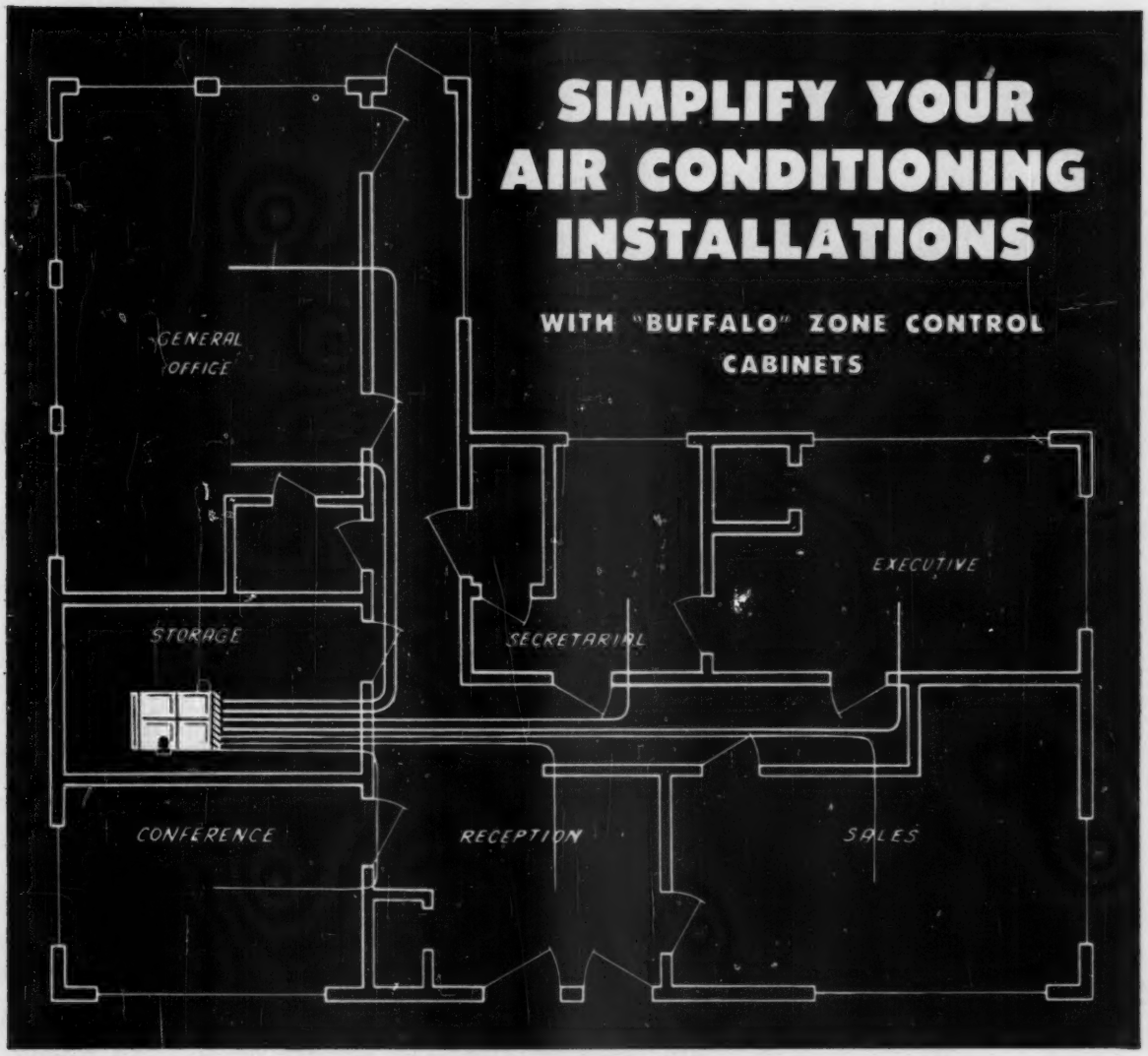
December is expected to be wetter than normal throughout most of this area. Alabama and Mississippi should experience temperatures in the 20's during the cold intervals indicated for the 4th through 7th and 24th through 28th of the month.



Generally, a stormy and cold December is in prospect over this area. Precipitation should exceed normal throughout most of the southern half extending into the Carolinas, and should be most important and heaviest during the last half of the month.

SIMPLIFY YOUR AIR CONDITIONING INSTALLATIONS

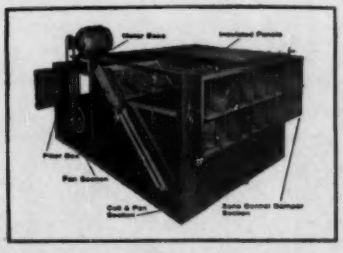
WITH "BUFFALO" ZONE CONTROL CABINETS



These quiet, compact, highly-efficient units are designed for installations where it is most feasible to use a single unit to provide varying degrees of conditioned air for several zones.

- Easy to assemble and install — shipped with sectionalized units, including fan and coil sections, zone dampers and optional accessories.
- Dependable, maintenance-free operation — heavy-gauge, corrosion-resistant construction insures long, satisfactory life on the job.
- Convenient to service — handy access doors, removable panels and outside-located bearings simplify servicing needs.
- Flexible — many combinations available — optional floor or ceiling mounting clips available; can be adapted to any combination of heating, cooling and/or dehumidifying.
- Space-saving design — unique coil angle permits maximum coil face area within minimum headroom and length.

Investigate the many advantages of "Buffalo" Zone Control Cabinets. Call your "Buffalo" engineering representative, or write for Bulletin AC-220.
"Buffalo" brings you "Q" Factor value — the built-in QUALITY that provides trouble-free satisfaction and long life.



Individual Year 'Round Comfort for all with this one compact unit! Temperature is controlled by mixing cooled and heated air in correct proportions to suit each conditioned space. No need for separate re-heat coils and their controls. Control for each area can be manual or completely automatic.

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Buffalo, N. Y.
Buffalo Pumps Division, Buffalo, N. Y.
Canadian Blower & Forge Co., Ltd., Kitchener, Ont.

"Buffalo"

VENTILATING AIR CLEANING AIR TEMPERING INDUCED DRAFT EXHAUSTING FORCED DRAFT COOLING HEATING PRESSURE BLOWING

4-D

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- electrical conduit
- snow melting systems
- hand railings
- curb plates
- scuppers
- bridge decks
- service building piping
- pier protection
- lamp posts
- tie bars, dowels
- fasteners

Write for technical data on specific applications

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Field Notes

MARJORIE ODEN
Eastern Editor

AT ITS ANNUAL CONVENTION in New York City recently, the American Society of Civil Engineers:

¶ Gave board approval to a method of prequalification for consulting engineers doing highway work.

¶ Ordered a study of the Code of Ethics, with a view toward revising or expanding its principles.

¶ Announced a new membership classification, to be decided upon in a referendum.

State Highway Work

ASCE board of direction voted to approve the "Suggested Guide Lines for Establishing Procedures for the Undertaking of Contracts with State Highway Agencies." This report was submitted by the ASCE-American Association of State Highway Officials highway division joint committee. The American Road Builders Association engineering division also was making a study of engineering fees and prequalifications of engineers at its convention last winter (see "Report from the East Coast," March 1958).

In the preamble, the "Guide Lines" explained that "an equitable and understanding procedure for prequalifying potential firms, with whom a highway agency may enter into contracts, can contribute to the rapid identification of firms competent to undertake particular kinds of work, and can aid in minimizing misunderstandings both by the engineering profession and by the public. It is the intent of this report to suggest some guide lines to state highway departments for . . . a prequalification procedure."

Under "general procedure," the joint committee stated that the process of prequalification should have two stages – the compilation of general lists of consultants capable of performing "given classes" of engineering work, and the establishment of a specific list of consultants who meet all requirements for a particular project.

"Involved in this approach to prequalification are: the setting up of qualifications based on stated criteria or requirements, the recognition that qualifications are to be established with respect to classes of engineering work, the compilation of lists of consultants who would, in general, be competent to do some one or several classes of engineering work, and the final preparation of a list of consultants who would be specifically qualified to undertake a particular job and their rating."

Suggested criteria for the compilation of a general list of acceptable consultants are:

"1. *Professional Qualifications* – Information should be obtained concerning the professional area or specialties in which the consultant is competent to practice. Evidence concerning quality of professional performance should be examined. There should be included information and evidence not only concerning the head of a consulting firm, but also concerning

How overhead handling saves space

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the big, colorful new booklet showing performance reports of Whiting products on the job . . . bringing new efficiency and economy to materials handling operations. Ask for booklet 242. *Whiting Corporation, 15620 Lathrop Avenue, Harvey, Illinois.*

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WHITING TRAMBEAM

MANUFACTURERS OF CRANES, TRAMBEAM HANDLING SYSTEMS, TRACKMOBILES, FOUNDRY, RAILROAD, AND CHEMICAL PROCESSING EQUIPMENT

key professional personnel in the firm. It may be desirable to develop an average rating representative of the professional competence of the consultant's organization.

"This evaluation should consider only experience with engineering problems similar to those which would arise in executing the projects under consideration.

"2. *Experience* – An appraisal should be made of the consultant's experience in the professional area or specialties in which he claims competence. Evidence to be examined would be length of time in professional practice and number, size, and complexity of jobs in the pertinent class of work or similar classes of work. It may be desirable to develop an experience rating scale.

"3. *Organization* – An appraisal should be made of the consultant's organization with respect to number and classes of personnel, experience and competence of personnel, distribution of personnel, floor space and facilities available to the organization, location of offices and facilities, and number and type of affiliates or advisers associated with the organization.

"4. *Reputation* – Here would be summarized and rated the consultant's reputation with respect to factors such as: excellence of plans, specifications, or other products of the consultant's efforts in the past, thoroughness of study, design, or field examinations or general performance, cooperativeness in conduct of work, both as it affects the contracting agency, and, if pertinent, as it affects the construction contractor and/or other consultants on parallel or collateral jobs.

"In addition to the above listed criteria for evaluating the consultant's qualifications as related to quality of engineering service, general information should be obtained concerning the following items:

"5. *Availability* – This relates to capacity to undertake engineering work. For the general list, some estimate of the over-all capacity of the consultant to undertake particular classes of work would be all that could be recorded. One possible way of stating this would be in dollars per month. Various units of work or service might be devised for particular types of work. Availability would be examined in detail when a specific list is being established for a particular job.

"6. *Financial Resources* – This pertains to the ability of the consultant to finance himself over the period of the work or service. For the general list, probably a general statement of the approximate maximum size of job (in dollars) that it is estimated the consultant would undertake, would be sufficient. Later detailed establishment of financial capacity would involve credit ratings, net worth, working capital, etc."

It was suggested that each state probably would want to separate the work into classifications, among

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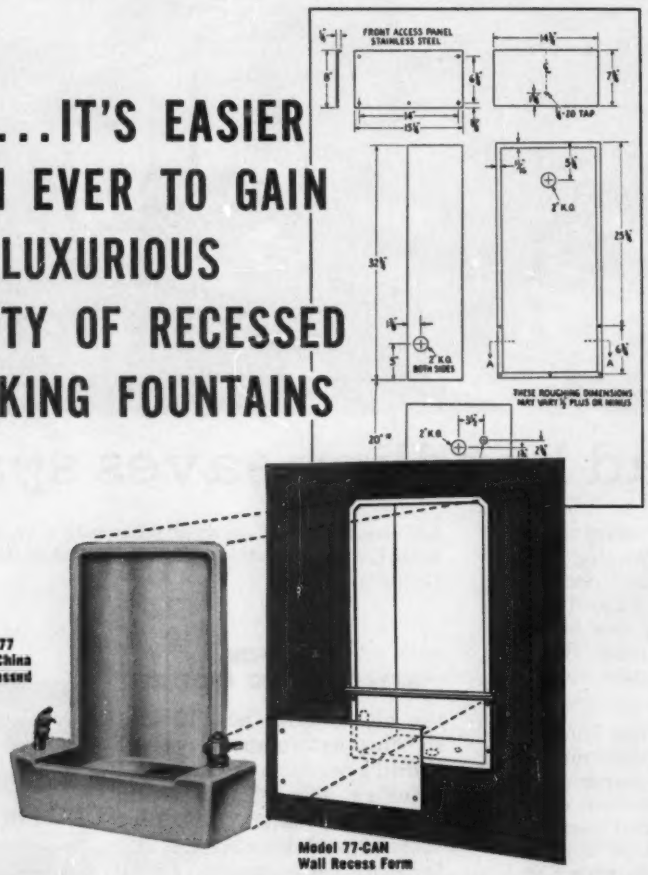

Model 77 Vitreous China Semi-Recessed

Model 77-CAN Wall Recess Form

WALL RECESS METAL FORMS for Haws Fountains... provide the exact required opening, access panels, knock-out holes, etc., for simple, efficient, economical installation. Install HAWS special metal "CAN" form in the unfinished wall, and the recessed fountain fits snugly and securely. Write for detailed specs on all HAWS recessed models, with special metal forms. Write today.

See HAWS Catalog in Sweets Architectural File

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JENKINS PRACTICAL PIPING LAYOUTS

82

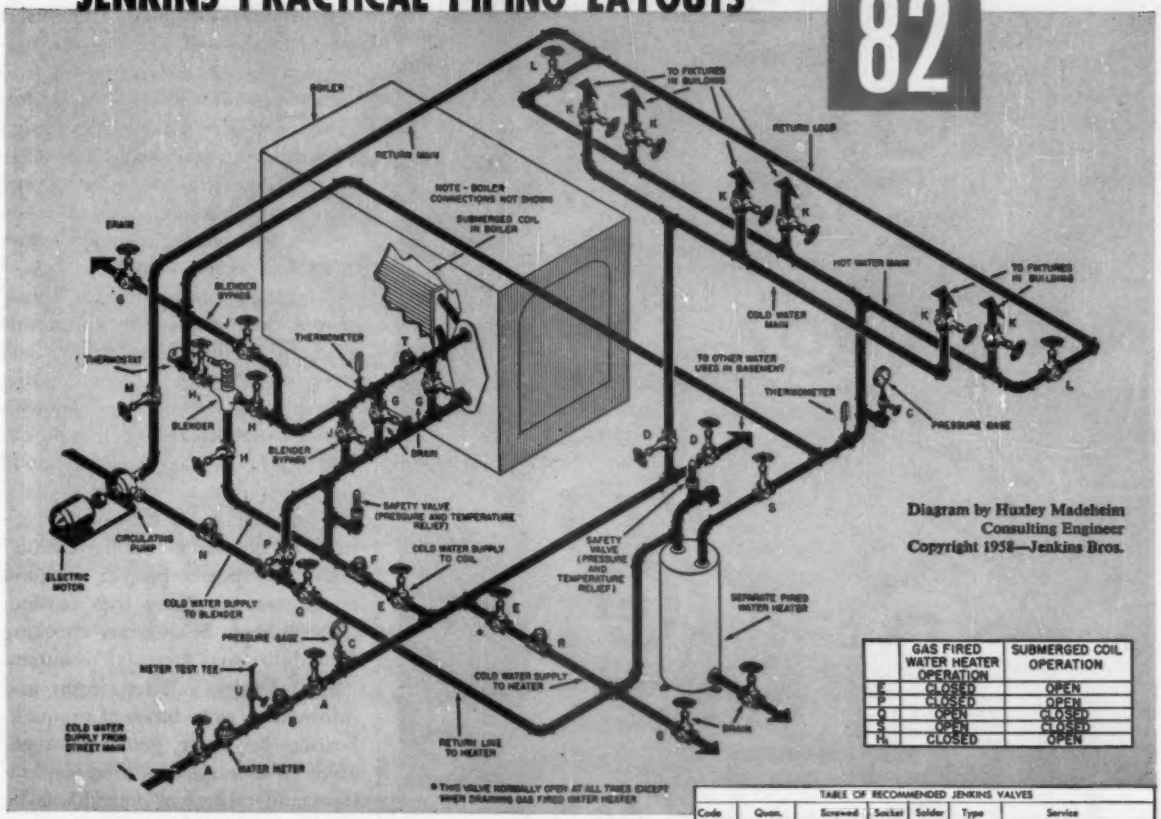


Diagram by Huxley Madeheim
Consulting Engineer
Copyright 1958—Jenkins Bros.

	GAS FIRED WATER HEATER OPERATION	SUBMERGED COIL OPERATION
E	CLOSED	OPEN
P	CLOSED	OPEN
Q	OPEN	CLOSED
S	OPEN	CLOSED
H_2	CLOSED	OPEN

TABLE OF RECOMMENDED JENKINS VALVES

Code	Quan.	Screwed	Socket	Solder	Type	Service
A	2	Fig. 47-U	1273	1242	Gate	Shutoff Cold Water Supply
B	1	Fig. 92-A	1272	1222	Check	Prevent Backflow to Main
C	2	Fig. 743-G			Needle	Control Pressure Gage
D	2	Fig. 47-U	1273	1242	Gate	Shutoff Cold Water Dist. System
E	2	Fig. 106-A	1270	1200	Globe	Control Cold Water Supply to Heaters
F	1	Fig. 92-A	1272	1222	Check	Prevent Backflow from Coil to Main
G	3	Fig. 106-A	1270	1200	Globe	Control Drains
H	3	Fig. 47-U	1273	1242	Gate	Shutoff Blender
J	2	Fig. 106-A	1270	1200	Globe	Control By-pass about Blender
K	6*	Fig. 106-A	1270	1200	Globe	Control Water Supply to Individual Fixtures
L	2	Fig. 106-A	1270	1200	Globe	Control Flow through Return Loop
M	1	Fig. 47-U	1273	1242	Gate	Shutoff Suction Circulating Pump
N	1	Fig. 92-A	1272	1222	Check	Prevent Backflow through Circulating Pump
P	1	Fig. 106-A	1270	1200	Globe	Control Flow Return Water to Coil
Q	1	Fig. 106-A	1270	1200	Globe	Control Flow Return Water to Heater
R	1	Fig. 92-A	1272	1222	Check	Prevent Backflow from Heater to Main
S	1	Fig. 47-U	1273	1242	Gate	Shutoff Hot Water Supply from Heater
T	1	Fig. 92-A	1272	1222	Check	Prevent Backflow through Coil
U	1	Fig. 106-A	1270	1200	Globe	Control Meter Test Line

*Dependent on quantity of fixtures.

How to plan piping connections for

A HOT WATER SUPPLY SYSTEM

using both Submerged Coil and Separate Water Heater

Continuous hot water for general use is a requirement of many small office buildings, taxpayers, stores, and sections of multi-story buildings. In this layout, two conventional methods of supplying hot water are shown in combination, assuring continuous supply throughout the year with a minimum investment and maximum convenience.

A submerged coil utilizes as a heat source the main boiler whose primary function is to furnish heat for the building. A separately fired heater is employed to provide continuous hot water should the main boiler be shut down during the non-heating season or for maintenance. Connections to both units of hot water generating equipment are arranged so that change-over involves only the operation of valves. The distribution system shown incorporates a circulating pump and return loop, to guarantee hot water at the fixtures at all times.

A Blender valve with the submerged coil permits tempering water to desired temperature, and is equipped with bypasses to permit blender maintenance and emergency repairs without a shutdown. The separately fired heater has its own thermostatic control, so does not require a blender valve.

Safety valves protect both hot water generators. These valves are installed without shutoff to prevent damage and especially damage from possible steam generation in the separately fired heater. Also, it is recommended that cold water admission valve "E" to this heater be left open at all times, except when draining heater, to prevent formation of a vacuum or burning of heater if evaporated dry.

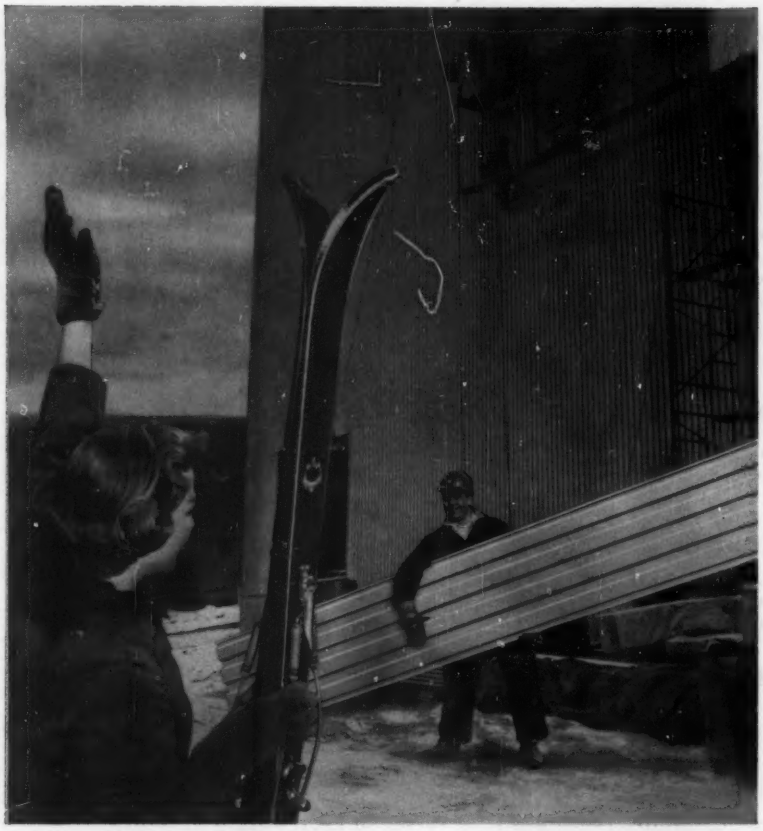
Bronze valves are used throughout because they give best service with most conditions of city water. All gate valves are of the traveling spindle type, which indicate position of wedge.

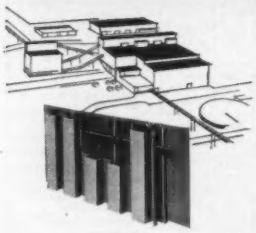
Jenkins Fig. 106-A screwed end bronze globe valve, (or its equivalent Fig. 1270 with socket ends, or Fig. 1270 with solder ends), is used extensively throughout this piping layout. Its renewable composition disc assures drop-tight closure, and it incorporates many other design and construction features which mean economical maintenance and long, trouble-free life.

To assure efficiency when planning a major piping installation, consult with accredited piping engineers and contractors, and select valves from the Jenkins Catalog.

FREE enlargement of this layout No. 82 sent on request to Jenkins Bros., 100 Park Ave., New York 17.

JENKINS
LOOK FOR THE JENKINS DIAMOND
VALVES
JENKINS
SINCE 1864
Jenkins Bros.
Sold through Leading Distributors Everywhere





Skiing weather is working weather with Milcor Wall Panels

Here, 1200 squares were erected fast in the cold of Northern Michigan's ski country

Temperatures drop mighty low in Iron Mountain, Michigan during December, January, and February. It gets too cold to make much headway with masonry construction. But weather didn't worry the Bechtel Corporation in the erection of M. A. Hanna Company's Taconite processing plant.

They closed in the building fast, by using Milcor exterior wall panels. These were quickly fastened to sub-girts with self-sealing, self-tapping screws.

Construction costs stayed down. And so will maintenance costs—Milcor exterior panels are Bonderized, fortified against corrosion.

Milcor Wall Panels are available also as field-assembled, non-load-bearing sandwich walls comprising interior steel liner panels, insulation, and fluted exterior panels.

For convenient planning help, see Sweet's section 3b/In — or write for catalog 243 giving complete details.

MILCOR® Wall Panels

It pays . . . in many ways . . . to specify Milcor Steel Building Products

MILCOR CELLUFLOR	MILCOR ROOF DECK	MILCOR RIBFORM	MILCOR CONVECTOR ENCLOSURE WALL UNITS	MILCOR METAL TRIM
Sweet's, section 2a/In	Sweet's, section 2f/InL	Sweet's, section 2h/In	Sweet's, section 30h/In	Sweet's, section 12b/In

INLAND STEEL PRODUCTS COMPANY Member of the Steel Family

DEPT. L, 4147 WEST BURNHAM STREET • MILWAUKEE 1, WISCONSIN • ATLANTA • BALTIMORE • BUFFALO CHICAGO • CINCINNATI • CLEVELAND • DALLAS • DENVER • DETROIT • KANSAS CITY • LOS ANGELES MILWAUKEE • MINNEAPOLIS • NEW ORLEANS • NEW YORK • ST. LOUIS.

WP-2

which the prequalifications list could be divided. Some of the suggested classes are bridges – ordinary; bridges – special, complex; design – 2-lane rural roads; design – multilane rural roads and freeways; inspection of construction; drainage studies; foundation studies; cost and economic studies.

In developing a specific list of prequalified consultants for a particular job, the joint committee said the highway department will have to develop its own rating scheme until "more experience with the prequalification process is obtained. Elements of judgment will be involved, since factors expressing quality are not fully susceptible to numerical differentiation."

For the specific project, the joint committee suggested that particular emphasis be put on checking availability and financial resources.

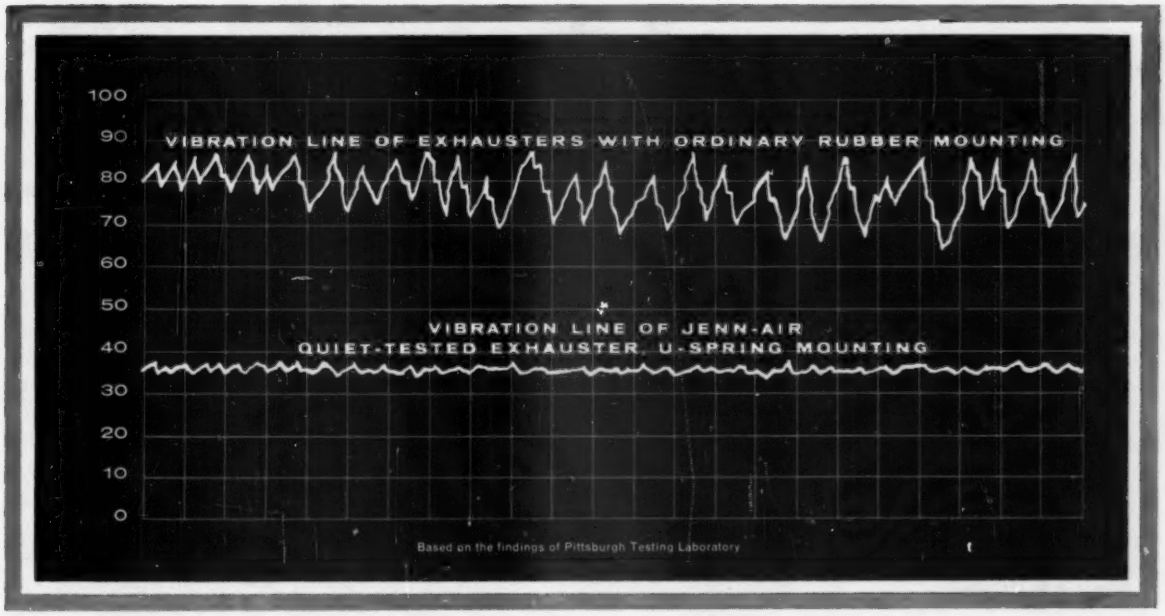
"It is suggested that forms and information as to bases of prequalification be made generally available. It is suggested that evaluations and ratings of consultants be kept confidential, since improper comparisons, etc., could unfairly damage the reputation of a consultant," the report concluded.

The Prequalifications Procedures will be published in a briefer form, in the revised ASCE *Manual* 29 fee schedule, which will be released next month.

The ASCE-AASHO Joint Cooperative Committee, in its annual report, announced that the prequalifications procedures was the first of four steps in its study.

The second step, selecting and negotiating with one prequalified firm at a time, still is being studied. The third step, negotiation of fees, was referred to a task committee and was scheduled to be included in the revised *Manual* 29. However, at last report, the Task Committee had not submitted recommendations and a separate booklet may have to be published.

The fourth step is the form of agreement for consultants and their highway department clients,



The above chart shows a comparison of vibration levels between ordinary exhausters and Jenn-Air Quiet-Tested Exhausters.

44% Less Vibration with JENN-AIR Quiet-tested Roof Exhausters!

Independent Laboratory Tests Prove Conclusively That Jenn-Air Quiet-Tested Roof Exhausters With U-Spring Suspension Show 44% Better Vibration Isolation Than Exhausters With Power Assembly Mounted in Rubber

Noise elimination is a problem which faces the ventilation industry today. To minimize the noise caused by vibration, Jenn-Air developed the Quiet-Tested Roof Exhauster with U-Spring cushion suspension. Now an independent laboratory offers proof positive this new principle of suspending the power assembly with U-Springs does the job. The PITTSBURGH TESTING LABORATORY, an independent research firm, was recently asked to compare Jenn-Air's Quiet-Tested Roof Exhauster, with U-Spring Suspension Mounting, against exhausters with ordinary rubber isolators. Tests were conducted under actual working conditions. Result: (see chart for dramatic evidence): *Jenn-Air Exhausters showed 44% less vibration transmission than the other exhausters.*

U-SPRING CUSHION SUSPENSION MOUNTING REDUCES VIBRATION . . . NOISE LEVEL

This innovation is another important improvement by Jenn-Air. It ensures against the major operating vibration and noise being transmitted through the duct work and into the building. The stainless steel also assures you the permanency of this quiet operation. Jenn-Air—and only Jenn-Air—Quiet-Tested Exhausters are proved under simulated field conditions. Each unit must pass rigid inspection by the critical *Vibronic Eye* . . . is 'screened' in Jenn-Air's Sound-Elec Test Chamber to detect noise and vibration.

Patents Pending

Jenn-Air Quiet-Tested Roof Exhauster, with U-Spring Cushion Suspension Mounting. Note low contour design which complements modern architectural lines.

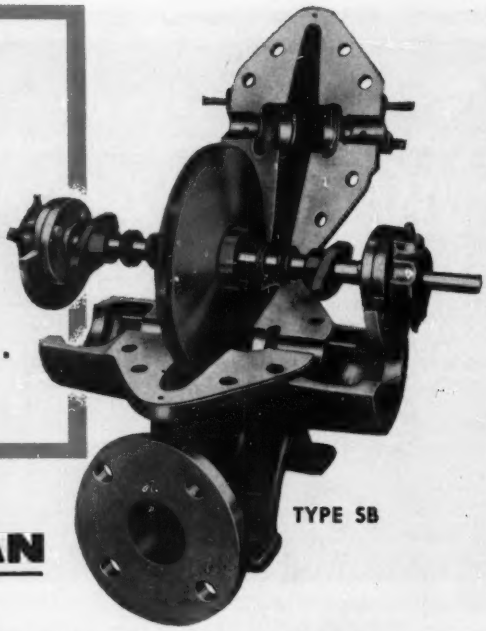
JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive • Indianapolis, Indiana

JENN-AIR PRODUCTS COMPANY, INC.
1102 Stadium Drive
Indianapolis 7, Indiana CE

Gentlemen:
Please send me free catalog giving complete information on how Jenn-Air U-Spring Cushion Suspension Mounting cuts vibration, lowers noise level.

Name_____
Title_____
Company_____
Address_____
City_____ State_____

AN OPEN AND SHUT CASE...



TYPE SB

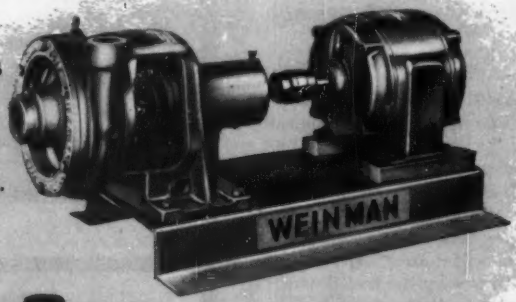
WEINMAN PUMPS

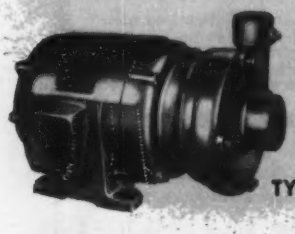
do more work at less cost!

This Weinman Type SB single stage, double suction pump costs less to buy, less to maintain. It's your best bet for low head, small capacity liquid handling. Easily handles a wide variety of pumping jobs efficiently with little or no attention. Takes ½ to 15 hp motors. Compact, gear-type flexible coupling doesn't need special tools for assembly and disassembly.

TYPE GB

Versatile Weinman Type GB single stage, end section centrifugal pumps handle 10 to 2000 gpm. Engineers tell us they are a favorite for every phase of liquid handling.





"The most compact and useful pumps ever designed" . . . that's what users say about Weinman Unipumps. Handy, they mount anywhere, walls or floors, horizontally and vertically. Just install them and forget them. You've never received such dependable performance.

TYPE AC

Write for your free Weinman pump bulletins. Complete information about cost-saving Weinman pumps. Or, call your Weinman pump specialist. He's in the Yellow Pages of your telephone directory.

THE WEINMAN PUMP MFG. CO.
2990 SPRUCE ST. COLUMBUS 8, OHIO

Centrifugal Specialists

and the joint Committee has not yet given final approval to this.

Ethics Report

A Special Task Committee on Interpretation of the Code of Ethics submitted a long report designed to clarify the existing Code.

However, the Board asked the task committee to "give further study to Article 4 of the Code of Ethics and to the subject of contingent fees, conferring with the Committee on Professional Conduct as necessary, to the aim of formulating language that will define and clarify the position of the Society on the subject of contingent fees."

The task committee, in its analysis of Article 4, reported that "possibly the most misunderstood and therefore the most frequently violated part of the ASCE Code is Article 4 relating to what may result in 'competitive bidding.'"

The committee lamented the fact that, in 1956, a revision in the Competitive Bidding portion of the Code was misinterpreted as "a relaxation on the part of ASCE."

"Certainly it was the intent of the several Boards of Direction and Society Committees involved to strengthen rather than relax this part of the Code. The records of the Society since adoption of the present wording sustain this intent," the task force added.

The report continued, "Solicitation of bids or proposals through the medium of public advertisement or any other notice that, in essence is the same thing, or submission of bids or proposals in response thereto, would be a clear violation of the engineering code of ethics. Moreover, requests for, or submission of, proposals on forms prepared by a prospective client, where the only variable item regarding services to be rendered and the manner in which they will be carried out is that of fee, would undoubtedly indicate a situation in which price would be the controlling factor and which would not be altered by a statement

Weldynamics

ARC WELDING AT WORK CUTTING COSTS

New Carquinez Bridge being fabricated and erected by American Bridge Division, U. S. Steel Corporation for the State of California.

Mechanized Manual Lincolnweld Submerged Arc Welder makes ½ inch fillet welds on corners of box sections.

WELDED CARQUINEZ STRAIT BRIDGE

gives taxpayers more for their money

THE use of welded fabrication and USS T-1 and A 242 high tensile steels in the construction of the Carquinez Strait Bridge will save the State of California almost $1,000,000.

Welded design saved tons of steel, simplified detailing, and produced a better looking bridge that will be easier to maintain than its riveted counterpart.

The heavy structural members were shop fabricated using Lincolnweld Automatic and Semi-Automatic Submerged Arc Welders. The Lincoln machines provided the speed and precise control necessary to keep welding costs at a minimum while producing dependable welds of the very highest quality.

Progress in bridge design is measured by the increased use of welded design . . . for better bridges at lower cost.

DESIGNERS & ENGINEERS!

"Studies in Structural Arc Welding" published periodically and sent free to architects and engineers.

"Procedure Handbook of Arc Welding Design and Practice" 1300 pages, 1100 illustrations, 466 page section on structural design for arc welding. $3.00 postpaid in U.S.A., $3.50 elsewhere.

Bridge Design Seminars are held regularly at our plant in Cleveland.

Write for information.

The World's Largest Manufacturer of Arc Welding Equipment

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West Hartford, Conn.

ARCHITECT Jeter and Cook Hartford, Conn.
ENGINEER Van Zelm Associates West Hartford, Conn.
GENERAL CONTRACTOR Industrial Construction Co. Hartford, Conn.
VENTILATION CONTRACTOR Homestead Insulation Co. East Hartford, Conn.

Unique Modern Banking Center Keeps Interior Bright and Clean with Cambridge AEROSOLVE® 85 Filters

An outstanding feature of this new banking center is the extensive use of colorful fabrics and bright walls and fixtures. Cambridge AEROSOLVE 85 Filters were selected to preserve the bright colors and avoid excessive maintenance costs by removing visible dust as well as the smudge-producing invisible particles which go right through ordinary filters.

Filters Serviceable Upstream or Downstream

Each bank in this center has its own air-conditioning system. In one, the AEROSOLVE filters are serviced from the upstream side; in the other, from downstream — a design feature which greatly simplified the air-conditioning layout.

Easy Servicing

The replaceable cartridges are held in permanent cadmium-plated frames and are secured by quick-acting fasteners. Beyond infrequent cartridge replacement, AEROSOLVE filters require no servicing or maintenance.

Flexibility to Meet Changing Needs

While AEROSOLVE 85 filters were installed as most suitable for the existing requirements, provision is made for changing to cartridges of higher or lower cleaning efficiencies as future conditions require. If dirt conditions in the atmosphere should become more severe, AEROSOLVE 95 filters can be substituted. Conversely, if filters of lower efficiency should prove adequate, AEROSOLVE 35 cartridges can be substituted. All AEROSOLVE cartridges are interchangeable.

Write for Bulletin 502

Cambridge Filter Corporation

732 E. Erie Blvd., Syracuse 1, N. Y.

Pioneers in High Efficiency Filtration

REPRESENTATIVES IN PRINCIPAL CITIES

that factors other than price will be considered."

This may or may not help to straighten matters out.

The Board also directed the Committee on Professional Practice to study the Code of Ethics with a view toward revision or expansion of its principles, and to combine the interpretation, amplification, and application of the Code of Ethics into a single manual which would include consideration of the ECPD Canons of Ethics, ASCE *Manual* 29, and its revision, the report of the Task Committee on Principles of Practice, the statement by R. Robinson Rowe on Engineering Ethics in Public Practice, application of the Code of Ethics to employee engineers in general, and case histories in professional conduct.

Membership Grades

New membership grades were approved by the Board, and will be put to ASCE members for a vote. In the past, there were junior members, associate members, and members. The new suggestions are for associate members, members, and fellows.

Fellows would be approximately what members were in the past, with these major differences:

a. Minimum age would be increased from 35 to 40 years.

b. Minimum years of responsible charge would be increased from five to eight years.

c. A fellow must be registered.

d. Admission would be only by transfer from the grade of member after not less than five years of responsible charge while he was a member.

Members would be similar to what now are associate members. But there would be differences:

a. Minimum age would be increased from 25 to 27 years.

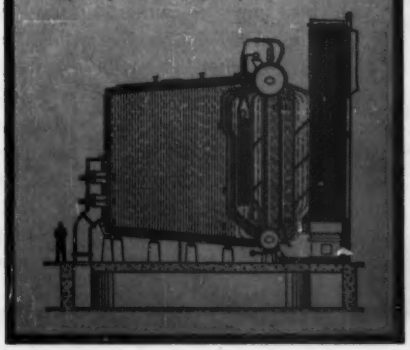
b. Minimum years of responsible charge would be increased from one to three years.

And admission to membership would be either directly or by ad-

C-E Boilers exceed guarantees at ANHEUSER-BUSCH, Inc.

The Newark, N. J., brewery of Anheuser-Busch, Inc. The seven year old power plant, left, is so spectacularly clean and neat that it has constituted a major attraction for professional and technical groups along the eastern seaboard. The popularity of these tours is such that, currently, reservations must be made two months in advance.

(Above) One of the two C-E Type VU-50-B, oil-fired boilers in the Newark brewery (cross-section below). Each has a maximum continuous capacity of 100,000 lb per hr and produces steam at 550 psi and 750 F. The floor in the foreground is chemically cleaned daily, polished twice weekly and completely refinished yearly.



In a brewery, the demands placed upon its boilers can be rigorous indeed. At the Anheuser-Busch brewery in Newark, New Jersey, they provide steam for power generation, for processing and for numerous high-capacity instantaneous water heaters used in various brewing and bottling operations. Since brewing is essentially a "batch" process, steam demands fluctuate sharply and continuously. Yet the C-E Boilers installed at Newark have consistently exceeded performance guarantees and operate at an efficiency of 86%.

Mr. Herman Paradies, Superintendent of Utilities at the Newark brewery, has stated that it is not unusual for steam demands to rise from 80,000 to 130,000 pounds per hour in ten to fifteen seconds, and that the boilers have responded with nominal loss in pressure or temperature. This enviable record, which speaks well both for boiler design and for the skills of the power plant's operating management and staff, is one of which Combustion is proud.

When *you* need boilers, remember that C-E has a complete line of time-tested and service-proved designs and that there is a size and type which will fit your needs and serve you equally well.

COMBUSTION ENGINEERING

C-E

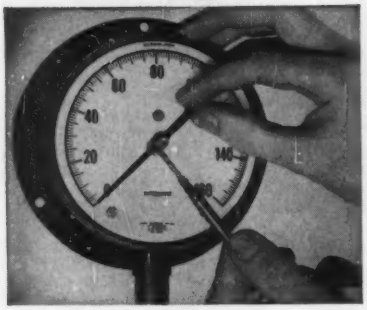
C-164A

Combustion Engineering Building
200 Madison Avenue, New York 16, N. Y.

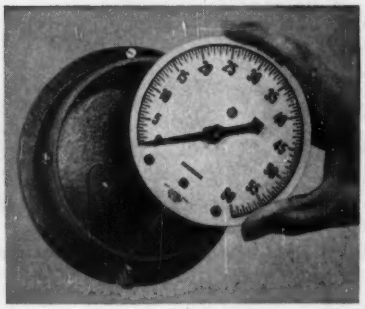
ALL TYPES OF STEAM GENERATING, FUEL BURNING AND RELATED EQUIPMENT; NUCLEAR REACTORS; PAPER MILL EQUIPMENT; PULVERIZERS; FLASH DRYING SYSTEMS; PRESSURE VESSELS; SOIL PIPE

SAVINGS IN MAINTENANCE TIME ALONE PAY FOR EVERY SUPERGAUGE IN YOUR PLANT

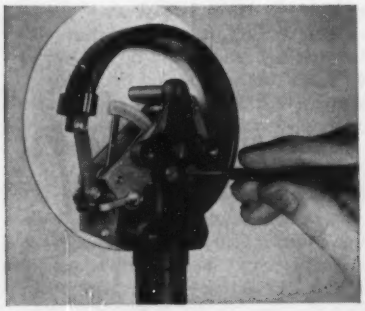
For example, with USG's exclusive Arc-Loc movement and Mono-Unit construction, complete recalibrations can be made up to 15 minutes faster than with any other process gauge. Here's why:



NOTE that with Supergauges, adjustments for "zero shift" can be readily made from the front, with gauge in operating position and without removing pointer from the shaft. Location of positive, self-locking worm adjustment screw on *side* of pointer prevents axial distortion of pointer or bending of shaft during adjustment.



NOTE that with USG Mono-Unit design, all Supergauge internals are integrated into a single assembly which can be removed in one quick operation. Complete legends on laminated plastic dials give gauge model number and materials used in construction of components for instant identification. More maintenance minutes saved!



NOTE that with USG's patented Arc-Loc movement, corrections for "scale shape" (linearity) errors and "range" adjustments are both made from the rear. No time is wasted in having to remove the pointer and dial. Each adjustment is a simple screwdriver operation; no special tools are required. In addition, USG's unique locking method eliminates creep during locking, further speeding recalibration time.

AND NOTE ESPECIALLY...

Supergauges meet ASA specifications for Grade AA Test Gauges, including accuracy within ½ of 1% of scale range. They are available in a full line, embracing a wide selection of case styles (including aluminum), case sizes, pressure ranges and materials of construction.

A companion line of SOLFRUNT (solid front construction) gauges is also available with the same fine USG features.

For complete information on SUPERGAUGE and SOLFRUNT process gauges, contact your local USG Distributor, or write for Catalog 1819.

UNITED STATES GAUGE
DIVISION OF AMERICAN MACHINE AND METALS, INC., SELLERSVILLE, PA.

USG

vancement from associate member.

An associate member would be similar to the present junior member grade. This was one of the primary "grades" responsible for the change. Prospective professional engineers had objected in many instances to being called "junior."

Major differences in the old junior member and his more dignified counterpart, associate member, would be:

a. An applicant who is not an engineering graduate would not be eligible for admission at this grade unless he has an acceptable Engineer-in-Training certificate.

b. Transfer to another grade instead of being mandatory at age 32 would be mandatory 12 years after admission to associate member grade unless, as now, an extension is granted for intervening military service.

Addenda

Other reports submitted showed:

Standard Forms of Agreement – The Civils and Architects have been working for quite a few years on a standard form of agreement. It seemed that victory was almost in sight, as the ASCE-AIA joint committee members agreed on the form, with modifications, early this year. Preliminary discussions even showed the two groups agreed on the modifications. Then the AIA submitted an entire new set of three documents, with the announcement that three more documents were to follow. "And there the subject rests."

Fees Payable – The Committee on Professional Practice had appointed a subcommittee to make recommendations as to appropriate fees payable when a member of one profession engages the services of the other. The subcommittee reported that practices vary so greatly geographically that setting standard fees would be "not feasible."

Unity – The Board asked NSPE, as a positive step toward unity, to affiliate simultaneously with EJC and ECPD. ▲▲

FINALLY!

A DIE-STAMPED, TWO-PIECE, LOW FRICTION LOSS 90° ELBOW

For High Velocity Air Movement Systems

NEW "LAMINAIR-FLO" 90° ELBOW, TYPE E-1

Now You Can Specify 90° Elbows With Consistent And Predictable Performance Characteristics

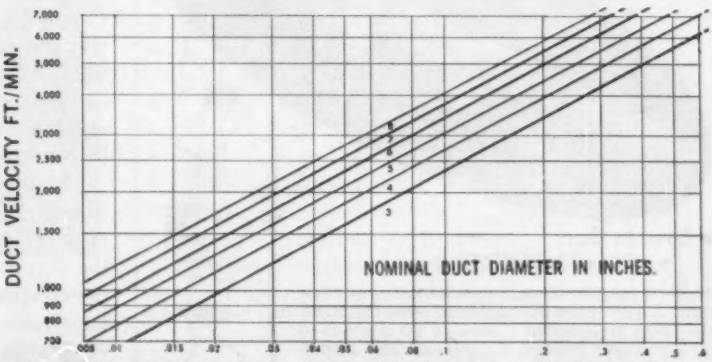
- 3", 4", 5", 6", 7", 8" Diameters
- 20 Ga. Galvanized Steel
- Continuous Weld
- Machine Made, Mass Produced

United's die-stamped, two-piece 90° elbows have been thoroughly tested by the engineering experiment station at a prominent university. The "Laminair-Flo" 90° elbows markedly reduce friction loss in high velocity systems, and are a logical replacement for hand-made segmented elbows.

"Laminair-Flo" 90° Elbow For A Lower Static Pressure Loss And Dependable Test Data

Static pressure loss figures of **five-piece** elbows, derived from all existing data, scatter over a range of ±20%. Reported values for **two-piece** "Laminair-Flo" 90° elbows are uniform because the die-stamped parts do not vary.

STATIC PRESSURE LOSSES OF "LAMINAIR-FLO" 90° ELBOWS, TYPE E-1



△P ELBOW, INCHES OF WATER AIR DENSITY 0.075 P.C.F. "ZERO LENGTH" LOSS. ADD TO DUCT FRICTION CALCULATED FROM INTERSECTION OF DUCT CENTERLINES.

Write to Division 128 for Price Information, Friction Loss Chart Manual and New Engineering Test Data.

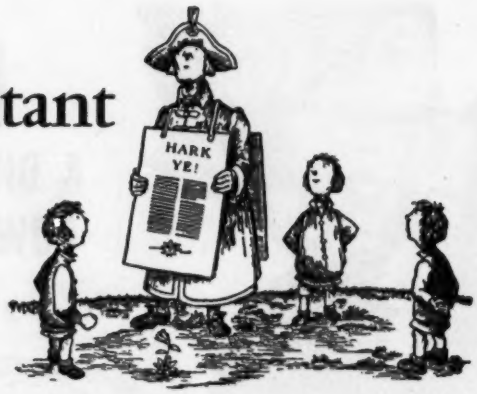
We'll See You At
14th International Heating & Air Conditioning Exposition
January 26-29 Philadelphia Booths #818-820

Another Advanced Design Product From

UNITED SHEET METAL CO., INC.
540 South Drexel Ave. Columbus, Ohio

Manufacturers of Spiral "Lockseam" Duct. Specialists in Low Loss Components For High Velocity Systems

News for the Consultant



Pneumatic Breakwater

Heavy waves at the entrance to Dover harbor in England have been reduced by giant air bubbles which create local turbulence, interrupt local wave action, and distort the harmonic motion of incoming waves. Waves 10-ft high are reduced 40 to 50 percent by this pneumatic breakwater.

Polyethylene air distributors are the heart of the breakwater system. The function of each distributor is to fill with air, and when full to discharge its contents suddenly in the form of large bubbles at intervals that can be precisely controlled from the shore.

Distributors are connected in 45-ft long sections, which are mounted on a strip of railroad line stabilized on the bottom of the harbor by two sleeping cars. There are 37 of these sections in the Dover installation. The distributors themselves are mounted on railroad coach chairs.

Compressed air at 30 psi is supplied to each section through a 1½-in. polyethylene header pipe leading to a manifold mounted on one of the sleepers. Branch lines of ½-in. polyethylene pipe run into each distributor, terminating in a ball-type nonreturnable valve which prevents supply line siltation. Header pipes are weighted with concrete sinkers to hold them in place.

Over 1500 ships have passed over the pneumatic breakwater at an average speed of 8 knots with no more than 10 feet clearance at low tide.

Previous attempts to calm the sea with compressed air pumped through a perforated pipe was uneconomical because of the heavy power demand. Less than one-tenth the power formerly needed is required for the new pneumatic breakwater. Air consumption for equivalent wave reduction has been cut from approximately 4.5 to 0.45 horsepower per equivalent yard with the Dover system. (For a discussion of more conventional breakwaters, see article beginning on page 92.)

Highway Pavement Under Test

A 300-man unit of the Army Transportation Corps has begun an accelerated two-year test program comparing the merits of concrete and asphalt highway pavements of varying thicknesses. Using 60 trucks of different types, carrying identical loads, the group will cross and recross over 800 sections of pavement—half concrete, half asphalt. The six-loop test track is in Ottawa, Illinois.

The experiment is sponsored by the American Association of State Highway Officials. A staff of engineers from the Highway Research Board of the National Academy of Sciences is in charge of the comprehensive project. Results will be of great importance to highway engineers in all parts of the world enabling more economical design of new highways and up-to-date evaluation of load-carrying capacities of existing ones.

Liberty Bridge Proposal is Rejected

The New York City Board of Estimate has rejected a proposal to substitute the Liberty Bridge from

ADJUSTABLE ACCENT LIGHTING
NEO-RAY ROTO-STRIP
U. L. & C.-S. A. Approved U. S. Pat. No. 2,790,894; Pat. in Can.
..for Stage lighting
..for Display Lighting
Stock sizes of 2'—3'—5'—8' Lengths.
Can be used for continuous runs.
For surface, corner or recessed mounting.
No. 13
No. 13C
No. 103
• Low in Cost
• Low in Installation
This complete, compact, adjustable, shallow unit...with built-in, recessed roto sockets, finger-tip adjustment...swings 90 degrees in all directions through a complete 360 degree circle. Stays put at any angle.
Send For Complete Catalog No. 541C
Sold Through Wholesale Distributors
MANUFACTURERS OF LIGHTING FIXTURES INCLUDING:
Louvred Ceilings • Roto-Strip • Luminoslit • Kleon-VU KVT Troffers
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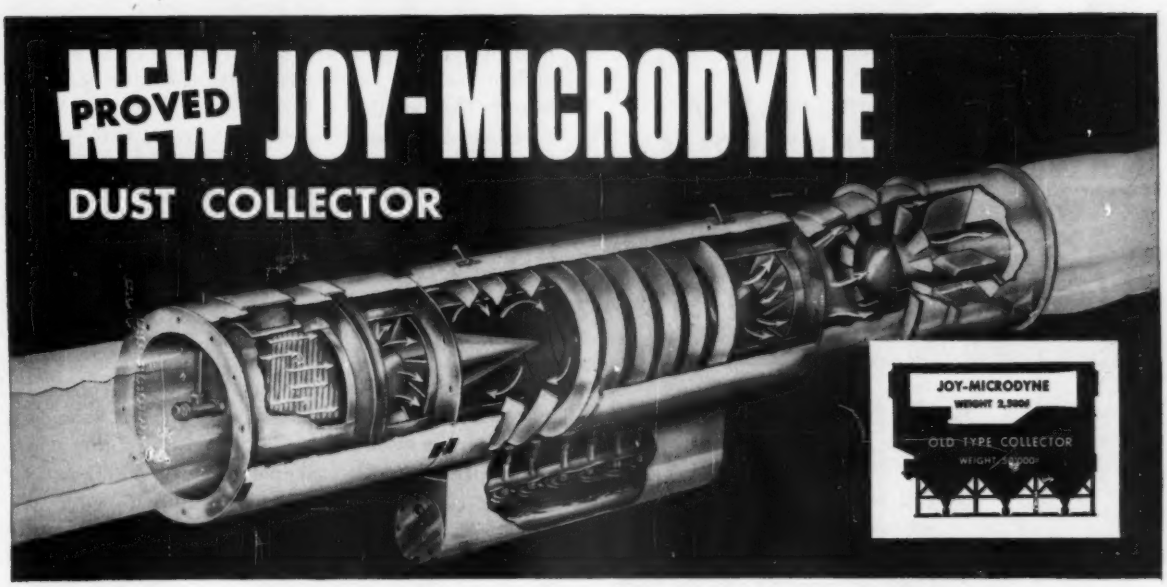
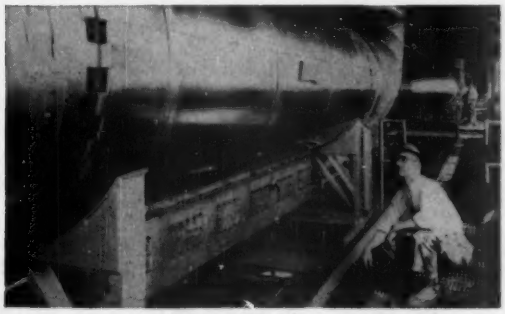


Profile of a Problem Solver

Here is an in-duct "educated pipe" that laughs at space, weight and water limitations as it collects over 99% of dust 5 microns and larger; 92% of 2-micron dust, and substantial amounts of smaller dust.

Particles enter through water-saturated air, slam against a water-film-covered impingement element, encase themselves in water droplets as they pass through, then whirl and collect on the sides of the middle section, to finally drain into a sump. Cleaned air is straightened and thrust on its way by an integral Joy Axivane Fan.



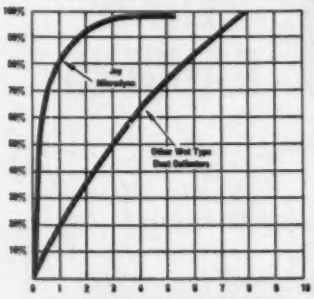
This 48,000 cfm installation shows compact assembly and space economy of in-duct placement.

SAVES SPACE—Installs as an integral section of duct-work; requires only 1/10 to 1/20 the space of conventional units. 2500 cfm unit is 10 feet long; 1.5 feet in diameter.

SAVES WEIGHT—Even the largest unit—64,000 cfm, 5 feet in diameter, 32 feet long—weighs only 6,500 pounds . . . or 1/5 the weight of conventional collectors. 2,500 cfm unit weighs only 325 pounds.

SAVES WATER—The largest Joy collector requires only 48 GPM flow—much less than comparable wet collectors. Add a Delpark Filter (Sold by Joy) and water can be recirculated to recover valuable dusts. The filter also reduces water borne solids to give a dependable, clear water supply from a dirty water source.

SUCCESSFUL INSTALLATIONS—Joy collectors from 500 cfm through 64,000 cfm are *now in use* collecting such widely varied dusts as hemitite, copper and uranium ores, coal, quartz, limestone, phosphate, stainless steel and titanium carbide grindings. For answer to your dust collecting problems, write, wire or call: ***Joy Manufacturing Company, Oliver Building, Pittsburgh 22, Pa.*** *In Canada: Joy Manufacturing Company (Canada) Limited, Galt, Ontario.*



Performance graph of actual installation shows efficiency of the Joy-Microdyne Dust Collector. (A micron is 1/25,000 inch)

WSW I 7002-231

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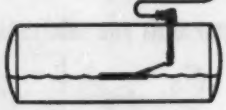

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LONG ISLAND CITY 1, NEW YORK

Brooklyn to Jersey City for the projected $330 million Narrows Bridge from Brooklyn to Staten Island. The board also turned down proposals for a vehicular tunnel under the Narrows. Estimates for a tunnel to equal the 12-lane capacity of the Narrows Bridge run over a half-billion dollars. The Narrows span and approaches are part of the city's $765 million highway plan devised jointly by the Triborough Authority and the Port of New York Authority.

Exposition Center in Chicago

Chicago's Metropolitan Fair and Exposition Authority has floated a $20 million bond issue for financing construction of an exposition center fronting on Lake Michigan. The completely air conditioned building is planned for year-round use with exhibition and recreational areas, meeting rooms, a restaurant, and an auditorium seating 5000.

New Beam Laminating Process

Wood technologists from Washington State Institute of Technology have developed a rapid, cost-saving procedure using a new type press that can produce in only seven minutes a weatherproof glued laminated beam that formerly required up to 24 hours to manufacture.

Features of this process include reduction to about one-sixth of present glue costs by use of straight phenolic resins in place of resorcinol mixtures and through a more efficient system of applying the adhesive. Only three men are required for the gluing operation compared with up to 13 with present methods. In addition, planing costs are reduced because there is no hardened squeeze-out of glue to dull planer knives.

School Construction

A special report by Rensselaer Polytechnic Institute to the New York State Education Commissioner contends that secondary schools can be constructed and maintained at costs far below current expenditures. Listed as contributing to these excessive building costs were:

¶ School district authorities arbitrarily contributing to unnecessary costs by insisting on monuments for their community with auditorium stages large enough to handle Broadway productions

¶ Glass walls being used where ordinary walls would save heat

¶ Too many lavatories

Principal recommendations included in the report called for careful selection of architects and engineers by education authorities, more attention to the cost of maintenance by designers, and use of modular planning, such as uniform beam lengths and mechanical units. ▲▲

FILE REFERENCE

FACT SHEET

GRAVER®

Water Problem Solved for United States Army Fort Meade, Maryland

U. S. Army Engineer District, Baltimore, Md.
In charge of base construction
Benjamin E. Beavin Company
Consulting Engineers, Baltimore, Md.
Ahlquist Bros. Construction Co., Inc.
Contractors, College Park, Md.
Graver Tank & Mfg. Co., Inc.
Design, Fabrication and Erection

Type: Double Ellipsoidal Elevated Tank
Capacity: 600,000 gallons
Height to Overflow: 111′ 6″
Head Range: 38′
Diameter of Tank: 55′
Built to AWWA Specifications
Aircraft warning lights in accordance with CAA regulations
Sterilized and Cathodic Protected

THE PROBLEM

An office building for the Department of Defense, comparable in size to the Pentagon, was completed last year at Fort George G. Meade, Maryland. The resulting influx of thousands of additional people to this military post called for the construction of 1,000 Capehart Housing Units near the office building. A major requirement for this project was the need to provide ample water for domestic use and for fire protection.

THE SOLUTION

The Corps of Engineers, Baltimore District, and the consulting engineers studied the problem and, based on Corps of Engineers criteria for water supply facilities, found that 600,000 gallons of elevated water storage was indicated for the project to meet the demand for present and future water requirements. In addition, a 50′ 3″ diameter by 41′ 6″ high reservoir of carbon steel was erected to supplement the present steel reservoir, with direct pumping facilities to the elevated water tank.

Graver was selected to design, fabricate and erect both the elevated water tank and the reservoir, as well as to provide sterilization, cathodic protection and aircraft warning lights.

The closely integrated cooperation between the Corps of Engineers, Benjamin E. Beavin Company, Ahlquist Bros. and Graver made the solution to the problem an easy one.

It will be to your advantage to discuss your water storage problems with a consulting engineer and Graver, whose mastery in metals is encompassed by a hundred years of experience in tank fabrication and erection.

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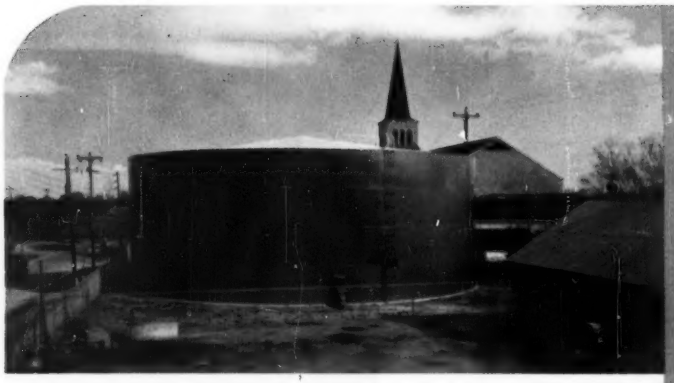

RESERVOIRS erected above ground or underground can be designed to store millions of gallons of water.

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STANDPIPES are especially designed to provide the static head required.

A CENTURY OF CRAFTSMANSHIP IN STEELS AND ALLOYS

Men in Engineering

Richard M. Bush has been appointed a senior consultant on the Washington, D. C. staff of Ebasco Services Incorporated. Prior to joining Ebasco, Bush spent 16 years with the U.S. Army Corps of Engineers as Power Branch chief.

BUSH FAIRBANKS

Three other recent appoints at Ebasco include: H. K. Fairbanks as consulting civil engineer; H. W. Stuber as chief concrete-hydraulic design engineer; and A. T. Larned as associate consultant in the consulting engineering division.

Howard C. Pyle, president of Monterey Oil Co., has been elected president of the American Institute of Mining, Metallurgical, and Petroleum Engineers. Pyle will take office for one year beginning at the AIME annual meeting in San Francisco in February 1959.

A new consulting engineering firm, Zimmerman, Evans and Leopold, with offices in Atlanta and Augusta, Georgia, has been formed for the practice of structural, mechanical, electrical, sanitary, and civil engineering. T. W. Ellis and W. B. Charter are associates of the new firm. All principals of the new firm formerly were members of Patchen and Zimmerman Engineers which has been dissolved.

Henry J. Brunnier, Structural Engineer, San Francisco, has been presented an honorary membership in the Structural Engineers Association of Southern California. This award is the fifth of its kind in the organization's 30 years.

Russell D. Taylor has been made a partner in the firm of Johannessen & Girand, consulting engineers of Phoenix, Arizona. Taylor formerly was manager of the firm's Tucson office.

TAYLOR GAMMETER

Erwin Gammeter, a vice president of Paul Weir Co., Inc., Chicago, has assumed new duties as department head of the company's coal mining mission in South Korea. A Paul Weir Co. team forms the mining portion of a joint industrial

4-D

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Write for technical data on specific applications

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roof drains feature self-cleaning bowls

Available in cast iron or brass, the Boosey roof sump can't collect or hold dirt. Strainer removes easily—all connections are visible and convenient to inspect.

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- All sizes—¾" x ⅛" to 2¼" x 3/16".
- Standard mesh with main bars on 1-3/16" centers and close mesh with main bars on .915 centers with cross bars on 4" or 2" centers.
- Safe, slip-proof surface.
- Available in plain or serrated main bars.

*Patents Pending

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group serving as general advisers and supervisors on economic improvement projects to increase South Korea's self-sufficiency.

At its recent annual meeting, the Association of Consulting Chemists and Chemical Engineers, Inc., elected the following officers for one-year terms: president, Erwin DiCyan, consulting chemist, Di-Cyan & Brown, New York City; vice president, Foster Dee Snell, Foster D. Snell, Inc., New York City; treasurer, Arthur Linz, consulting chemist, New York City; and secretary, William C. Bowden, Ledoux & Co., Inc., Teaneck, N. J.

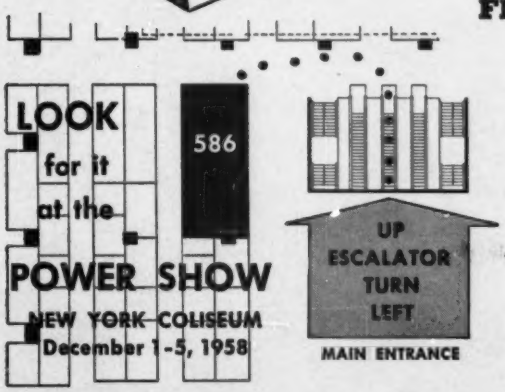
As part of a major expansion program, Wilsey and Ham Engineers and Planners, Millbrae, California, have appointed four division managers to supervise work projects and direct staff management affairs. They are: Gordon Tillson, San Mateo; Jack Van Zandt, San Carlos; B. J. Whitlow, San Rafael; and William B. Wright of Millbrae. Other appointments include: Abraam Krushkhov, head of the newly established planning division; Robert S. Reed, advance projects coordinator; Robert E. Smart, contract administration; and Edward Beall, controller.

New president of United Engineering Trustees, Inc., is Andrew Fletcher, president of St. Joseph Lead Company. Fletcher succeeds Walter J. Barrett.

Louis O. Britt, vice president of Dudley Deane and Associates, San Francisco consulting engineering firm, has been promoted to general manager. Donald R. Lundy has joined the company as chief mechanical engineer.

Patterson-Emerson-Comstock, Inc., Pittsburgh engineers and constructors, announce the appointment of Robert A. Solborg as management representative in Europe, with headquarters in Paris. ▲▲

HERE'S YOUR *Complete* STEAM PLANT



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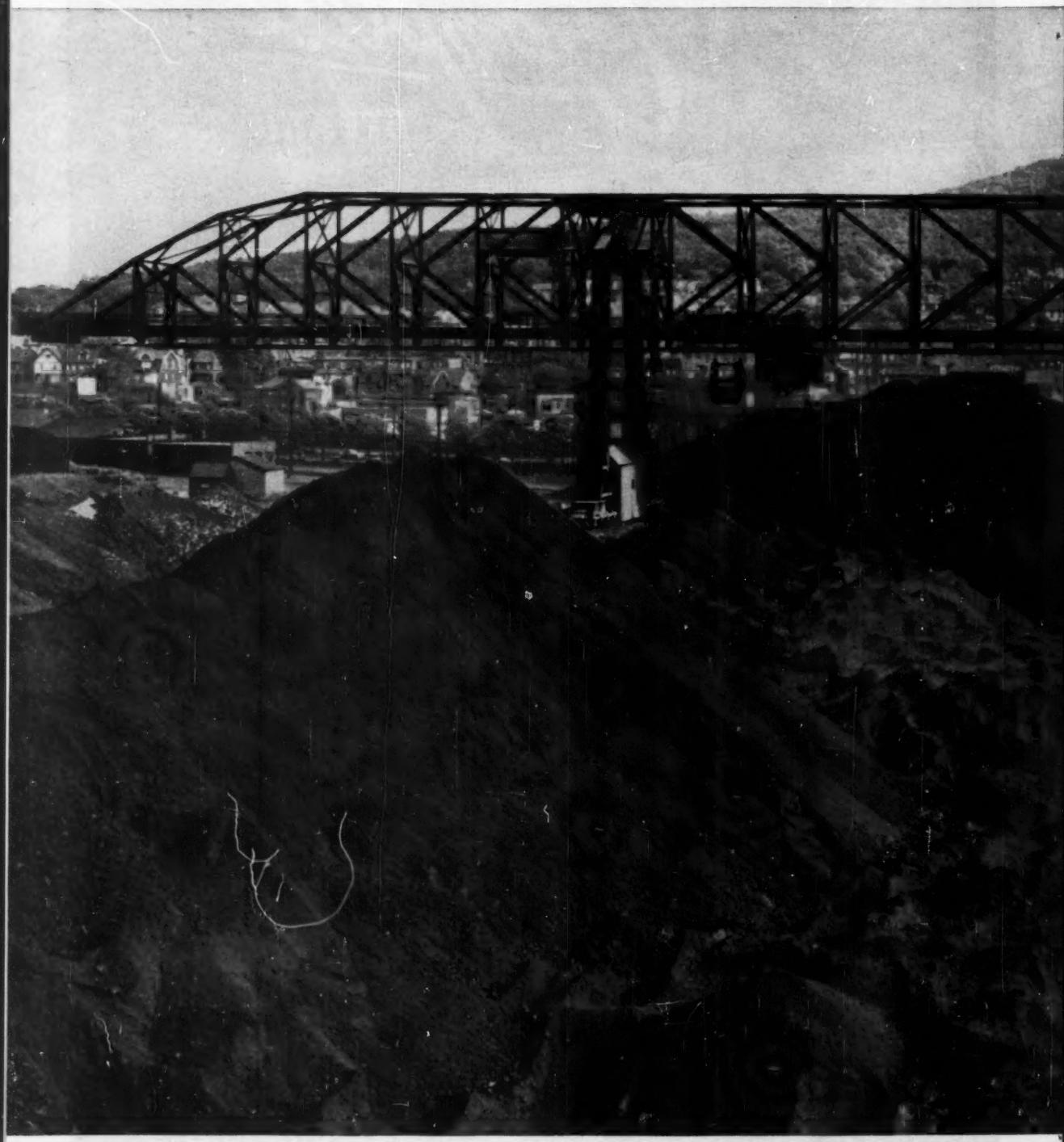

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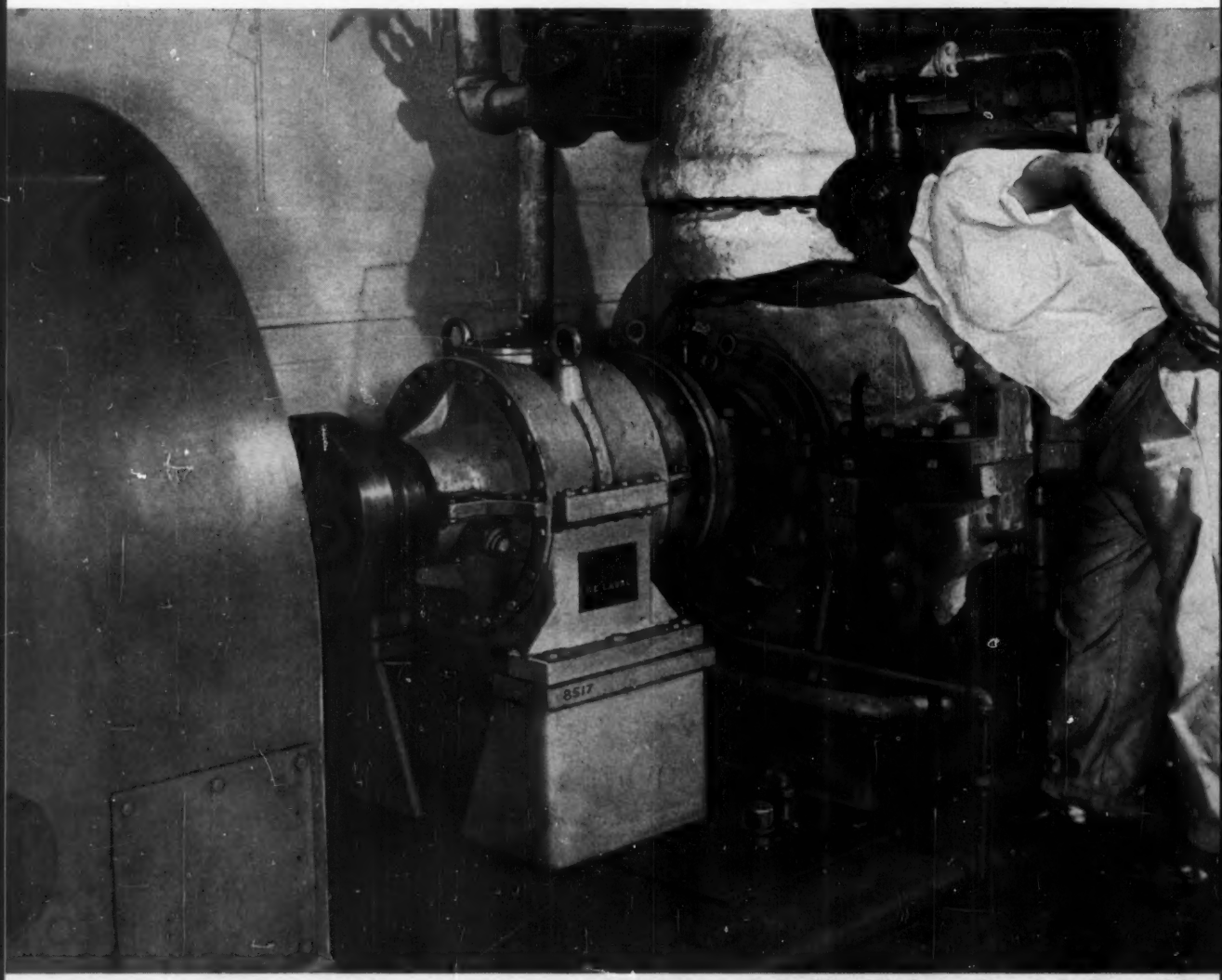

De Laval-Stoeckicht Gear at Homasote Co., Trenton, N. J.

2800 Horsepower in a 22" package!

That compact "package" you see in the center of the picture above is a De Laval-Stoeckicht Planetary Gear. Developed by Dr. Stoeckicht in Germany, this gear has been proved in hundreds of European installations. It is capable of transmitting 2800 horsepower from the steam turbine at the right to the generator at the left. It weighs only 900 pounds.

A conventional gear for this service would weigh 4000 pounds. And the De Laval-Stoeckicht gear takes up less than half the space of a conventional gear. This is another example of how De Laval *creative engineering* plus precision manufacturing and highest quality control assure lasting customer satisfaction.

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builds these products...

- *Centrifugal pumps*
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- *Centrifugal Compressors and Blowers*
- *Centrifugal gas pipeline compressors*
- *IMO positive displacement pumps*
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- *Diesel engine turbochargers*
- *Planetary gears*
- *Multi stage steam turbines*
- *Turbine generators*
- *Ship propulsion machinery and marine auxiliaries*
- *Hydraulic reverse reduction marine gears*

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New Projects Reported

By Consulting Engineers

ALABAMA

J. W. Goodwin Engineering Company
Birmingham, Alabama
¶ Birmingham airport improvements. (civil). $2.5 million. Client, City of Birmingham.
¶ Shades Valley sewage treatment plant. (civil) $1.5 million. Client, Jefferson county, Ala.
¶ Huntsville, Ala. sanitary sewer. (civil) $4.5 million. Client, Huntsville, Ala.

ALASKA

N. W. Haner & Associates, Partner
North Pacific Consultants
Portland, Oregon
¶ Cooper Lake hydroelectric power development involving dam and hydroelectric power plant with transmission line from Cooper Lake to Anchorage, Alaska. (civil, struc., mech., elec.) $12.5 million. Client, Chugach Electric Assoc.
¶ Transmission line from Cooper Lake to Kasilof, Alaska. (civil, struc., mech., elec.) $1 million. Client, Homer Electric Association.

ARKANSAS

L. M. McGoodwin, Consulting Engineer
Fayetteville, Arkansas
¶ Airport runway. (civil) $60,000. Client, Springdale, Ark.
¶ Airport runway lighting. (civil, elec.) $80,000. Client, Rogers, Ark.
¶ Sewers, outfall. (civil) $90,000. Client, Bentonville, Ark.
¶ Sewers, outfall. (civil) $80,000. Client, Harrison, Ark.
¶ Streets. (civil) $50,000. Client, Gravette, Ark.

CALIFORNIA

King, Benioff & Associates
Sherman Oaks, California
¶ Music and arts building, Ventura college, Ventura, Calif. Band, choral, and private practice rooms, TV production, full stage with grid and auditorium. (struc.) $750,000. Client, Harold E. Burket, Architect.

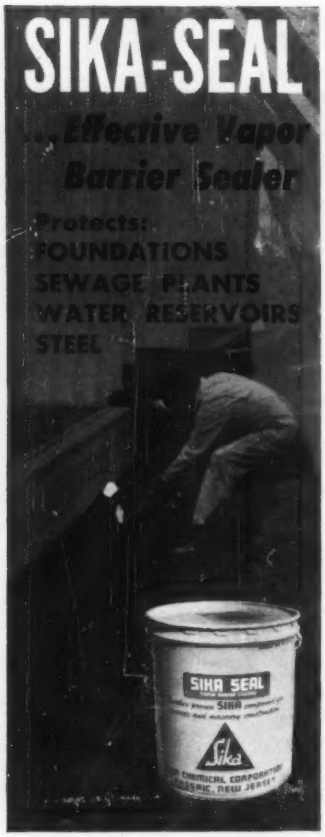
Kistner, Wright & Wright
Los Angeles, California
¶ Additions to terminal annex postoffice, Los Angeles. (civil, struc., mech., elec.) $3,820,000. Client, General Services Administration.

E. J. Kelly & Associates, Inc.
Los Angeles, California
¶ Alcohol distillation facilities. $40,000. Client, Bireley's Division, General Foods Corporation.

Thomas G. Atkinson, Structural Engineer
San Diego, California
¶ Hilltop senior high school, San Diego. (struc.) $1.2 million. Client, Kistner, Curtis & Foster, Architects.
¶ Industrial building, Motor, Machine & Supply Corporation, San Diego. (struc.) $125,000. Client, Naegle, Coffey and Associates, Architects.

Wilsey & Ham
Millbrae, California
¶ Design and engineer major drainage district project, City of Hemet, Riverside county, Calif. (civil) $10,000. Client, Riverside County Flood Control District.
¶ Develop feasibility study for Marin county airport, master plan. (civil) Client, County of Marin, Calif.
¶ Plans and specifications for sewage collection system. (civil) $150,000. Client, City of Pacific, Calif.
¶ Plans and specifications for expansion of manufacturing and distribution building, Burlingame, Calif. (struc.) $96,000. Client, Taylor Products Corporation.

Cline, Zerkle & Agee
Berkeley, California
¶ Santa Maria high school, Santa Maria, Calif. (civil, struc., mech., elec.) $175,000. Client, Santa Maria Unified School District.
¶ Orcutt primary school, Orcutt, Calif.



Sika-Seal forms a tough, flexible and durable coating that provides an immediate vapor barrier when applied to structural materials.

It protects concrete, mortar, steel and other metallic and non-metallic surfaces. With Sika-Seal, your structure is protected from attacks by water, salt, dilute acids, mild alkalies and sea water — because Sika-Seal resists them all!

Moreover, Sika-Seal is a proven time and money saver since it can be painted directly on either damp or dry surfaces without delaying backfill operations.

In short, Sika-Seal is the ideal protection for wherever control of moisture, condensation and corrosive vapor is a must. For complete information on Sika-Seal, write or wire for Bulletin SS-58.

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(civil, struc., mech., elec.) $375,000. Client, Orcutt Unified School District.
¶ Cotton warehouse, Kern county, Calif. (civil, struc., elec.) $72,500. Client, Camp & Felder Compress Company.
¶ Winery warehouse, South San Francisco, Calif. (civil, struc.) $133,200. Client, Pellegrini Brothers.

COLORADO

Ken R. White
Denver, Colorado
¶ Eight-story apartment building, lightweight concrete, prestressed, Denver, Colo. (struc.) $500,000. Client, Robert Hiester, Architect.
¶ Elementary school, Adams City, Colo. (struc.) $350,000. Client, A. W. Grant, Jr., Architect.
¶ Complete topographic mapping of all owned and leased property together with geological studies. Photogrammetric work by subsidiary company of Ken R. White, Falcon Air Maps. Client, Martin-Denver missile plant.
¶ Site selection study for airport, Rangely, Colo. (civil) Client, Board of Commissioners, Rangely, Colo.
¶ Addition to water treatment plant, Rangely, Colo. (civil, struc., mech., elec.) $75,000. Client, Town of Rangely, Colo.

DELAWARE

Daniel Koffler and Associates
New Castle, Delaware
¶ New roof on structural steel frame on new footings, walls to be underpinned, some new walls and additional interior and exterior work, truck terminal, Wilmington, Dela. (struc., mech.) $15,000. Client, Scari Delivery Service.
¶ New fire-resistant roof on new structural steel frame, new footings and columns, new walls of aluminum panels to reduce load on existing footings, additional interior and exterior work including mechanical and electrical, truck terminal, Wilmington, Dela. (struc., mech., elec.) $20,000. Client, Stewarts Express.
¶ Consultation and redesign of business building to conform to county building code, Glasgow, Dela. (struc.) $20,000. Client, Stuckey's, Inc.

Goodkind & O'Dea
Bloomfield, New Jersey
¶ Four miles of six-lane limited access interstate highway, including two interchanges and eight structures. (civil, struc.) $7 million. Client, Delaware State Highway Department.

FLORIDA

E. J. Kelly & Associates, Inc.
Los Angeles, California
¶ Citrus concentrating plant expansion including freezing and cold storage, Fort Pierce, Fla. $500,000. Client, TreeSweet Products Company.
¶ Water supply system in Haines City, Fla., including cooling tower, pumps, and design of water system. $70,000. Client, Stokely-Van Camp, Inc.
¶ Citrus distillation process, Ocala, Fla. $120,000. Client, Libby, McNeill & Libby.

Jesse V. Boyles
Bartow, Florida
¶ Water system improvements. (mech., civil, elec.) $500,000. Client, City of Auburndale, Fla.
¶ Parking areas and street paving. (civil) $200,000. Client, Garner Aviation, Bartow Air Base, Bartow, Fla.

GEORGIA

J. C. Harrison, Consulting Engineer
Spartanburg, South Carolina
¶ 285-unit apartment building, Atlanta, Ga. (mech.) $2 million. Client, D. W. Cecil, Architect.

Walter H. West & Associates
Atlanta, Georgia
¶ Peachtree Road Lutheran church, Atlanta, Ga. (mech., elec.) $32,000. Client, Mastin & Summer, Architects.
¶ Office and warehouse, General Foods Corporation, Atlanta, Ga. (struc.) $100,000. Client, Timothy McCarthy Construction Company.
¶ Firestone service building, Atlanta, Ga. (struc.) $60,000. Client, Mastin & Summer, Architects.

IDAHO

Briggs & Associates
Boise, Idaho
¶ Six miles of street construction, grading, gravel, light duty oil mat, Garden City, Idaho. (civil) $30,000. Client, Village of Garden City, Idaho.
¶ Waterworks, well, pumping station, 1200 gpm deep-well turbine pump, controls, meters, valves, chlorinator, 14,500-gallon hydro pneumatic pressure tank and controls, building, grounds, fencing. (civil, struc., mech., elec.) $25,000. Client, Village of Garden City, Idaho.
¶ Waterworks and sewage treatment construction. Reconstruction of existing transmission, distributing system, services, meters, well, spring and stream source of supply and sewage treatment plant. (civil, struc., mech., elec.) $600,000. Client, City of Malad, Idaho.
¶ 1200 gpm deep-well turbine pump, 15,000-gallon hydro pneumatic tank, controls, building, Boise. (civil, struc., mech., elec.) $30,000. Client, Overland Water Company.

Johnson & Underkofler
Nampa, Idaho
¶ Curbs, gutters, sidewalks, and paved streets. (civil) $900,000. Client, City of Mountain Home, Idaho.
¶ Advance planning study and preliminary engineering report for city-wide storm sewer system. (civil) $500,000. Client, City of Nampa, Idaho.
¶ Advance planning study and preliminary engineering report for providing additional storage, distribution mains, and supply facilities for domestic water system and provide for conversion to a

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POWER PLANT
Boiler Feed Pumps

Wow— you get all TURBINE PUMP advantages... with DOUBLED SERVICE LIFE

TWO STAGE, CENTER MOUNTED
1750 RPM
CAPACITIES TO 150 GPM
PRESSURES TO 300 PSI

Exclusive DuraHard® Electrolized Impeller

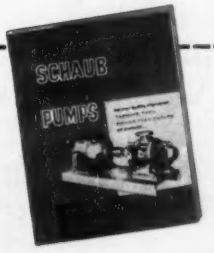
This Schaub Impeller has a surface hardness nine-tenths that of a diamond (1100 Brinell). This super-hard "skin" INCREASES IMPELLER LIFE UP TO 300%. Resists wear, corrosion, erosion—will not chip, peel or spall. When or if it eventually wears through, the base metal in its original dimension still has a normal service expectancy.

With Schaub Power Plant Pumps and their almost diamond-hard ELECTROLIZED IMPELLERS, you can count on *double* the service life you'd normally expect from a standard fitted turbine pump! They offer all the turbine-type's inherent advantages: wide head range without motor overload or cavitation. And in every "over-strength" component they match the extraordinary durability of their impellers. Features like these make maintenance and service almost negligible:

- **Oversize pre-lubricated double-row ball bearings**
- ***Improved* Fleximatic Shaft Seals—no packing problems, scored shafts, lubrication wash-out or leaks. (Seals can be replaced in minutes when necessary *without* dismantling the pump.)**
- ***Extra heavy duty* housing, shafting and bearing arms keep pumps "in-line" and prevent warpage.**
- **Excellent NPSH characteristics — certified GPM performance at suction heads as low as 3 feet!**

Schaub Power Plant Pumps are *standard* on most larger Schaub Boiler Feed Systems and available for individual pump and replacement needs. *Specified either way, you get the most durably engineered turbine type pump yet produced.*

FRED H. **SCHAUB** ENGINEERING COMPANY
2103 S. Marshall Boulevard, Chicago 23, Illinois



MAIL COUPON FOR TECHNICAL BULLETIN No. 65

Capacities, ratings, general pump facts, specifications, dimensions. Designed for power and consulting engineers.

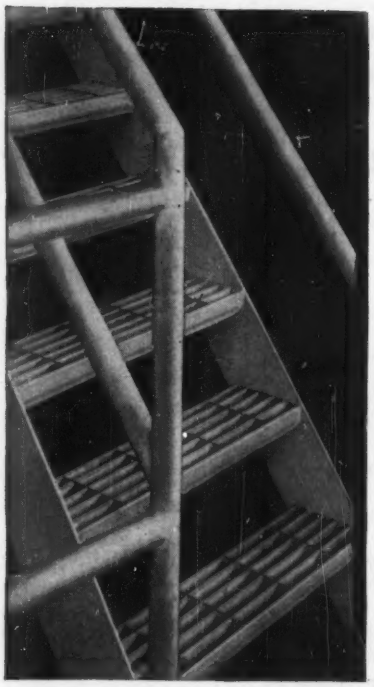
Please send my personal copy of Technical Bulletin No. 65.

Name_____

Company_____

Address_____

City_____ Zone_____ State_____



SHUR-SITE TREADS

... the best step for

SAFETY

Hendrick Shur-Site Treads have a non-slip surface that *insures* safety, making them the best choice for your stairs, ladders and fire-escapes. A heavy nosing bar provides reinforcement where the load is greatest. Shur-Site Treads are constructed by a pressure forming process, and so have no angle irons, bolts or rivets to collect dirt and refuse. Their 90% open area lets in plenty of light and air.

Shur-Site Treads are available in standard sizes or in special widths and lengths. They are shipped ready to bolt directly to stair stringers.

Hendrick
MANUFACTURING COMPANY
42 DUNDAFF STREET, CARBONDALE, PA.
Sales Offices in Principal Cities

combined domestic and sprinkling irrigation water system. (civil) $600,000. Client, City of Nampa, Idaho.

ILLINOIS

E. Lionel Pavlo
New York, New York
¶ Two-span rigid frame bridge carrying east-west route and spanning two ramps. Rigid frame also carries portion of foundations for second level tri-state bridge. (struc.) $2 million. Client, Illinois State Toll Highway Commission.

Thomas J. Higgins Associates, Inc.
Chicago, Illinois
¶ Four-classroom addition to Parkview school, Morton Grove, Ill., 64 x 66, 1-story. (civil, struc., mech., elec.) $100,000. Client, Board of Education, District 70, Cook county, Ill.
¶ Oxidation pond, one acre for raw sewage from 80-person monastery, West Chicago, Ill. (civil) $8000. Client, Christ the King Seminary, Franciscan Fathers.
¶ Sewage treatment plant, 63,000-gallon septic tank, 500-gallon duplex siphon dosing tank, 1500 ft sanitary sewers, 3500 ft drain field for 600-pupil Hooper school, Lindenhurst, Ill. (civil). $14,000. Client, Board of Education, School District 41, Lake county, Ill.

INDIANA

Joseph Rakowski & Son
East Chicago, Indiana
¶ Doctor's clinic, East Chicago, Ind. (struc., mech., elec.) $75,000. Client, Dr. J. C. Nicosia.
¶ Apartment building, East Chicago, Ind. (struc., mech., elec.) $90,000. Client, John Grdinich.

IOWA

Frank L. Pulley
Des Moines, Iowa
¶ Heelan high school addition, Sioux City, Iowa. (mech., elec.) $650,000. Client, William Beuttler & Son, Arch.
¶ Moore school addition, Des Moines, Iowa. (mech., elec.,) $250,000. Client, Wetherell & Harrison.
¶ Montezuma high school, Montezuma, Iowa. $525,000. Client, Wetherell & Harrison.

Keyes C. Gaynor
Sioux City, Iowa
¶ Land fill by dredging 550 cu yards. (civil) $110,000. Client, I.D.E.A., Inc.
¶Smithland drainage district. (civil) $38,800. Client, Woodbury county, Iowa.
¶ Sewage treatment plant. (civil) $67,000. Client, Whiting, Iowa.
¶Water main extensions. (civil) $10,000. Client, Whiting, Iowa.

KANSAS

Bucher & Willis
Salina, Kansas
¶ 10.6 miles of roadway and bridges on Route 24 near Beloit, Kansas. (civil, struc.) Client, Kansas State Highway Commission.
¶ 15.5 miles of roadway plans, FAS 683 and 1074, Scott county, Kansas. (civil) $150,000. Client, Scott County Board of County Commissioners.
¶ Precast concrete grain elevator design, Broughton. (struc.) Client, V. Hoover.
¶ First Presbyterian church, Great Bend, Kansas, structural plans only. (struc.) $400,000. Client, Evans-Rondeau & Associates, Architects.

LOUISIANA

Fred Kull, Consulting Engineer
Monroe, Louisiana
¶ Additions to factory building for Lincoln Enterprises, Ruston, La. (mech., elec.) $100,000. Client, Rivers & Heuer, Architects.
¶ Stadium for Jonesboro high school, Jonesboro, La. (mech., elec.) $80,000. Client, Rivers & Heuer, Architects.
¶ Gymnasium for Jonesboro high school, Jonesboro, La. (mech., elec.) $180,000. Client, Rivers & Heuer, Architects.
¶ Educational building for First Baptist church, West Monroe, La. (mech., elec.) $250,000. Client, B. G. Jacka, Arch.

Pan American Engineers
Alexandria, Louisiana
¶ Design, plans, specifications, and supervision of construction and contract administration for rehabilitation of existing utilities, repair and strengthening of existing roads and two 4500-ft runways and new construction of terminal building and airfield lighting to transform old Esler army airfield into modern municipal airport of trunk-line class. (civil, struc., mech., elec.) $1.7 million. Client, Rapids Parish Police Jury, Alexandria, La.
¶ Design, plans, specifications, and supervision of construction and contract administration for enlargement of existing electrical switchgear house and expansion of electrical switchgear for increased power distribution of Louisiana State university. (struc., elec.) $200,000. Client, Louisiana State university.

R. D. Percy
Baton Rouge, Louisiana
¶ Street improvements, Zachary, La. (civil) $90,000. Client, town council.
¶ University Terrace elementary school addition. (civil, struc., mech., elec.) $85,000. Client, East Baton Rouge Parish School Board.
¶ Alamo Plaza motel additions. (civil, struc., mech., elec.) $100,000. Client, Alamo Plaza Hotels, Inc.

MARYLAND

Herbert L. Bregman, P.E.
Norfolk, Virginia
¶ Coca-Cola bottling plant and offices. La Plata, Md. 26,000 sq ft, heating, ventilating, air conditioning, plumbing, and electrical. (mech., elec.) $85,000. Client, George M. Smith, Jr., Architect.
¶ Sixty bowling alleys, heating, venti-

WHEN DIRECT DRIVE VENTILATION EQUIPMENT IS DESIRED . . .

Specify *Peerless-Electric*® Non-Overloading Direct Drive Blowers

Tested and rated to AMCA specifications. All-welded wheels statically and dynamically balanced. Motor base, frame and housing completely welded together for added strength on larger sizes. 12½" to 36½" wheel diameters. 1,110 to 24,560 c.f.m.

No obstruction at inlet. Air enters blower wheel through smooth, spun venturi, passes quietly through wheel and discharges over airfoil cutoff. Peerless-built, self-limiting horsepower motor prevents overloading at any condition.

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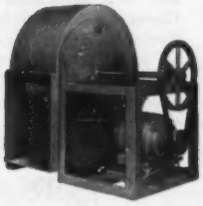
Peerless-Electric® NON-OVERLOADING BELT DRIVE UTILITY BLOWERS



Designed for efficient, continuous, quiet duty in air conditioning systems in schools, labs, public buildings, industrial and commercial installations.

Simplicity of construction and sound engineering assure years of highly efficient, low noise level operation. 12½" to 36½" wheel diameters . . . 686 to 26,044 c.f.m.

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A COMPLETE LINE OF AIR MOVING EQUIPMENT

Member of the Air Moving and Conditioning Association, Inc. (AMCA)

Peerless-Electric®

FAN AND BLOWER DIVISION

THE *Peerless-Electric*® COMPANY

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FANS • BLOWERS • ELECTRICAL MOTORS

Locate Your Nearest Representative in the "Yellow Pages"

SEE OUR CATALOG IN SWEET'S

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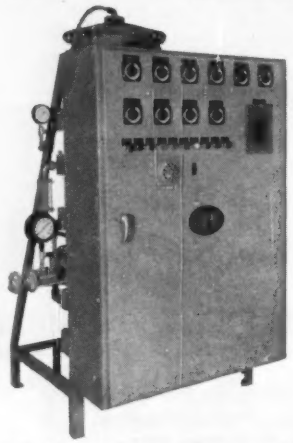
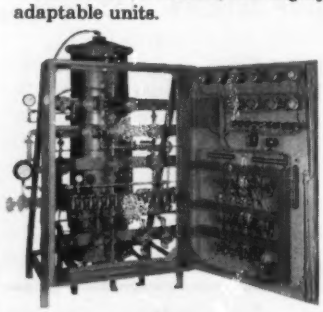
AUTOMATIC
"Package Unit"
MIXED-BED
DE-IONIZER



For all types of processes requiring very pure water. Completely automatic. All functions easily adjustable. Completely assembled, ready for hook-up. Made in a range of practical sizes. *Write for particulars* on these new, valuable, and highly adaptable units.



ILLINOIS WATER TREATMENT CO.
840 CEDAR ST., ROCKFORD, ILL.
NEW YORK OFFICE: 141 E. 44th St., New York 17, N.Y.
CANADIAN DIST.: Pumps & Softeners, Ltd., London, Can.

ILLCO-WAY

lating, air conditioning, and plumbing. (mech.) $110,000. Client, George M. Smith, Jr., Architect.

Eiser & Akers
Baltimore, Maryland
¶ Remove seven hydraulic elevators and sidewalk lift and replace with operatorless type electric gearless elevators. (struc., mech., elec.) $900,000 (est.) Client, Fidelity & Deposit Company of Maryland.

MASSACHUSETTS

Boston, Massachusetts
¶ Reconstruction of Longfellow bridge including Boston approaches. (civil, struc.) $1.2 million. Client, Commonwealth of Massachusetts, Metropolitan District Commission.

MICHIGAN

Harry J. Fuller
Mount Clemens, Michigan
¶ Concrete street paving and water, Chesterfield township. (civil) $30,000.
¶ Concrete street paving, East Detroit. (civil) $290,000. Client, East Detroit.

Lanterman Associates
Ann Arbor, Michigan
¶ Dexter, Mich., Huron River, lake control project affecting Portage Lake and Base Line Lake in Washtenaw and Livingston counties, including dam construction and channel modification. (civil, struc.) $200,000. Client, Washtenaw & Livingston counties, Michigan.

E. Roger Hewitt Associates, Inc.
Lansing, Michigan
¶ Oak View school, Muskegon, Mich. (mech., elec.) $560,000. Client, Magnuson & Sumner.
¶Lansing medical and dental building, Lansing, Mich. (mech., elec.) $850,000. Client, Mayotte & Webb.
¶ Addition to Sparrow hospital, Lansing, Mich. (mech., elec.) $1,250,000. Client, O. J. Munson Associates.
¶Mayflower Congregational church, Lansing, Mich. (mech., elec.) $100,000. Client, Charles V. Opdyke.
¶ Cleaning plant, laundry, Lansing. (mech., elec.) $125,000. Client, C. V. Opdyke.
¶ Addition to U.S. postoffice, Lansing, Mich. (mech., elec.) $700,000. Client, O. J. Munson Associates.
¶ Transmitter station, WILS-MSU, Onondaga, Mich. (mech., elec.) $100,000. Client, O. J. Munson Assoc.

MINNESOTA

Henry Schipke & Associates
Minneapolis, Minnesota
¶ Warehouse addition and modification of materials handling systems for plant producing formula feed in Saint Paul. 16-ft clear height concrete block, bar joist and steel deck construction. (civil, struc., mech., elec.) $80,000. Client, Northwest Cooperative Mills, Inc.

MISSISSIPPI

E. Lionel Pavlo
New York, New York
¶ Vicksburg bridge, U.S. 80, through truss bridge; length of structure, 2940 feet; over-all length of structure and approaches; 10,000 feet; height, 115 feet. (struc.) $27 million. Client, Mississippi and Louisiana State Highway Depts.

MISSOURI

Ervin Colnon
Saint Louis, Missouri
¶ Fusion cast refractory plant, Saint Louis, Mo. (civil, struc., mech.) $1 million. Client, Worsh Refractory Corp.

Williamson & Associates
Saint Louis, Missouri
¶ Garbage disposal project, metropolitan area Saint Louis. (civil) $575,000. Client, City of Saint Louis, Mo.
¶ Sewage disposal project including sewage treatment plants, outfall, interceptor sewers, and pumping stations. (civil) $2.5 million. Client, Cape Girardeau.
¶ Sewage disposal project including sewage lagoon, outfall, interceptor sewers, and pumping stations. (civil) $280,000. Client, City of Pacific, Mo.
¶ Flood control project, non-Federal costs on Saint Louis Federal flood protection project, including railroad, utility, and building removals, and relocations. (civil) $3 million. Client, City of Saint Louis.
¶ Storm sewer project, Woodson Terrace sewer district, Saint Louis county, Mo. (civil) $200,000. Client, Metropolitan-Saint Louis Sewer District.
¶ Waterworks system, deep well, elevated tank, and distribution system. (civil) $110,000. Client, City of Matthews.

NEBRASKA

R. H. Reed & Company
Columbus, Nebraska
¶ 25 miles of 34.5-kv transmission line and two substations. (elec.) $225,000. Client, Butler County Rural Public Power District, David City, Neb.

Henningson, Durham & Richardson
Colorado Springs, Colorado
¶ Report on sewage treatment needs. (civil) $500,000. Client, City of Gering.

NEW JERSEY

Hoerig & Daleassio
East Orange, New Jersey
¶ Housing project, Hakensack, N.J. (struc.) $500,000. Client, C. Cleveland.
¶ Repeater station, New Jersey Bell Telephone Company, Kearny, N.J. (struc.) $500,000. Client, R. Flatt, Arch.
¶ Recreation room and auditorium addition, First Presbyterian and Trinity church, South Orange, N.J. (struc.) $300,000. Client, V. M. Reynal, Arch.

Michael M. Burris
Englewood, New Jersey
¶ Fort Dix nurses' BOQ, Fort Dix, N.J.

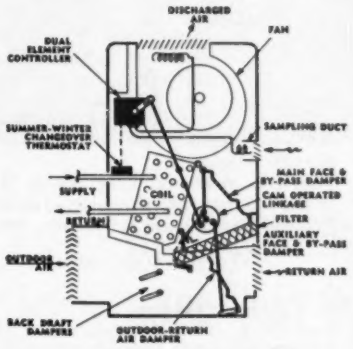
THE MARK OF QUALITY

BARBER COLMAN

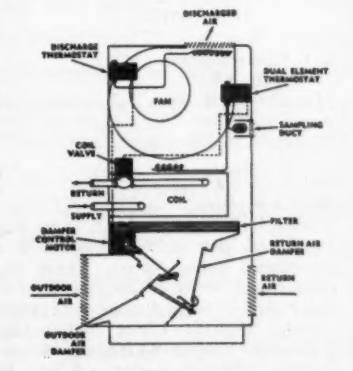
Now... improved controls for all types of unit ventilators

NEW! Dual-element thermostat combined with motor operator for face and bypass units.

NEW! Plug-in change-over thermostat for year-around face and bypass units.



FACE AND BYPASS CHAMBER CONTROLLED UNIT



VALVE CONTROLLED UNIT

Combined thermostat-and-motor operator mounts directly on unit for greater control accuracy and lower installation cost.

New all-electric Barber-Colman unit ventilator controls combine the function of thermostat and damper operator in a single "package." This eliminates the need for a wall thermostat and reduces on-the-job installation cost. (Factory installation is also practical.) Chalk dust or dirt problems and "temperature-tampering" by unauthorized personnel are eliminated.

Superior control is achieved by the dual-element principle. Sensing bulbs are used in both a room air sampling chamber and in the discharge air stream. This is the proved aspirating principle employed in the most exacting laboratory control installations.

Barber-Colman offers you the most advanced controls for *every* unit ventilator installation — steam, hot water, hot and chilled water, gas, and electric.

Ask for New Application File

— specifications and complete details on control hookups for all leading makes and models of unit ventilators. Call your local Barber-Colman representative or write today.

BARBER-COLMAN COMPANY

Dept. L, 1360 Rock Street, Rockford, Illinois • Field Offices in Principle Cities

Automatic Controls • Small Motors • Industrial Instruments • Aircraft Controls
Electrical Components • Air Distribution Products • Overdoors and Operators
Molded Products • Metal Cutting Tools • Machine Tools • Textile Machinery

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LO-BOY
CENTRIFUGAL
ROOF EXHAUSTERS

Enhance The Beauty Of Building Skylines

Pats. Pend.

Lowest Silhouette Design

FORWARD OR BACKWARD CURVE WHEEL WITHIN . . . OR OUT OF SCROLL HOUSING

Motor mounting on side of structure support . . . out of line of air stream reduces height of Lo-Boy models nearly 50% of older designs.

LOW WIND RESISTANCE SIZES 10"-72"
600-47,000 CERTIFIED C.F.M. RATINGS
• QUALITY • BEAUTY
• PROVEN PERFORMANCE

See Sweet's File 20c/Amm or Write for bulletin CE100 58

AMMERMAN CO., INC.
110 North Second St.
Minneapolis 1, Minnesota
MEMBER OF THE AIR MOVING & CONDITIONING ASSN.

Utilities, site grading, landscape. (civil) Client, Ziegler, Childs and Paulsen.
¶ Paterson public housing, site grading, utilities. (civil) Client, Kelly & Gruzen.
¶ Drainage study for southeast Tenafly, Tenafly, N.J. Creek relocation and landscaping of water storage ponds. (civil) Client, Borough of Tenafly.
¶ Grossinger's hotel, Grossinger, N. Y., grading, landscaping, new approach roads, and utilities. (civil) Client, Kelly & Gruzen.

NEW YORK

Goodkind & O'Dea
Bloomfield, New Jersey
¶ Relocation of 8 miles of New York Central Railroad, Oneida, N.Y. Includes new freight facilities, station, and eight structures eliminating at grade crossings of local streets and roads. (civil, struc.) $6.5 million. Client, New York State Department of Public Works.

Meyer, Strong & Jones
New York, New York
¶ 15 Broad Street, New York City, air conditioning. (mech., elec.) Client, J. P. Morgan & Company.
¶ Chase Bank, New York City. (elec.) $90,000. Client, Chase Bank.
¶ 220 East 42nd Street, New York City. (mech., elec.) $20 million. Client, New York Daily News.
¶ 1 Madison Avenue, New York City, final phase. (mech., elec.) $11 million. Client, Metropolitan Life Insurance Company.
¶ New press building, New York Times, New York City. (mech., elec.) $14 million. Client, New York Times.
¶ Western Electric Company, New York City. (mech., elec.) $25 million. Client, Western Electric Company.
¶ Riverside church, south wing. (mech., elec.) $11 million. Client, Riverside church.
¶ Equitable Life Assurance Society, New York City, new home office. (mech., elec.) $50 million. Client, Equitable Life Assurance Society.

Gennaro Mianulli
Brooklyn, New York
¶ Mercy high school, Riverhead, L.I. (struc.) $2.5 million. Client, William J. Boegel, Architect.
¶ Cunard building alterations, new elevators, New York City. (struc.) $150,000. Client, John J. Foley.
¶ Community center, Queens, N. Y. (struc.) $800,000. Client, Michael W. Frudakis, Architect.

Karl J. Bea Associates
Pulaski, New York
¶ Motor vehicle storage building, national guard armory, Oswego, N.Y. (civil, struc., mech., elec.) $50,000. Client, Carl W. Larson, state architect.
¶ Offices and warehouse, F. A. Crossman, Inc., Syracuse Industrial Park, Syracuse, N.Y. 24,000 sq ft tilt-up construction. (complete design) $125,000. Client, William C. Pahl Construction Company.
¶ Offices and warehouse, Bee Electric Company, Syracuse, N.Y. 8000 sq ft tilt-up construction. (complete design) $80,000. Client, Bee Electric Company.
¶ Drive-in store, Thom McAn Company, Syracuse, N.Y. 7300 sq ft tilt-up construction. (complete design) $70,000. Client, Joseph Cashier Company.
¶ Offices, 6000 sq ft, brick and steel, air conditioned, Syracuse, N.Y. (complete design) $92,000. Client, Eastern Milk Producers Co-op Association, Inc.
¶ Municipal building and fire station, Syracuse, N.Y. 6000 sq ft brick and concrete. (complete design) $57,000. Client, Village of Pulaski, N.Y.
¶ Bakery and warehouse, Wegman Company, Rochester, N.Y. 60,000 sq ft tilt-up construction. (struc.) $500,000. Client, A. Charles Pioch, Architect.
¶ Supermarket, Wegman Company, Rochester, N.Y. 24,000 sq ft tilt-up construction. (struc.) $200,000. Client, A. Charles Pioch, Architect.
¶ Supermarket, P. & C. Food Stores, Waterloo, N.Y. 8000 sq ft tilt-up construction. (complete design) $60,000. Client, William C. Pahl Construction Company.

Charles H. Pratt
Syracuse, New York
¶ Split Rock water supply district. Provide six lateral extensions to present system. (civil) $115,000. Client, Town of Onondaga, N.Y.

P. Anthony Sarubbi
Yonkers, New York
¶ Yonkers Metals (scrap metal salvage). (struc.) $25,000. Client, M. A. Capobianco, Architect.

Herbert L. Bregman, P.E.
Norfolk, Virginia
¶ Shroeder residence, Long Island, N.Y. Panel heating and plumbing. (mech.) $12,000. Client, Leavitt Associates, Arch.

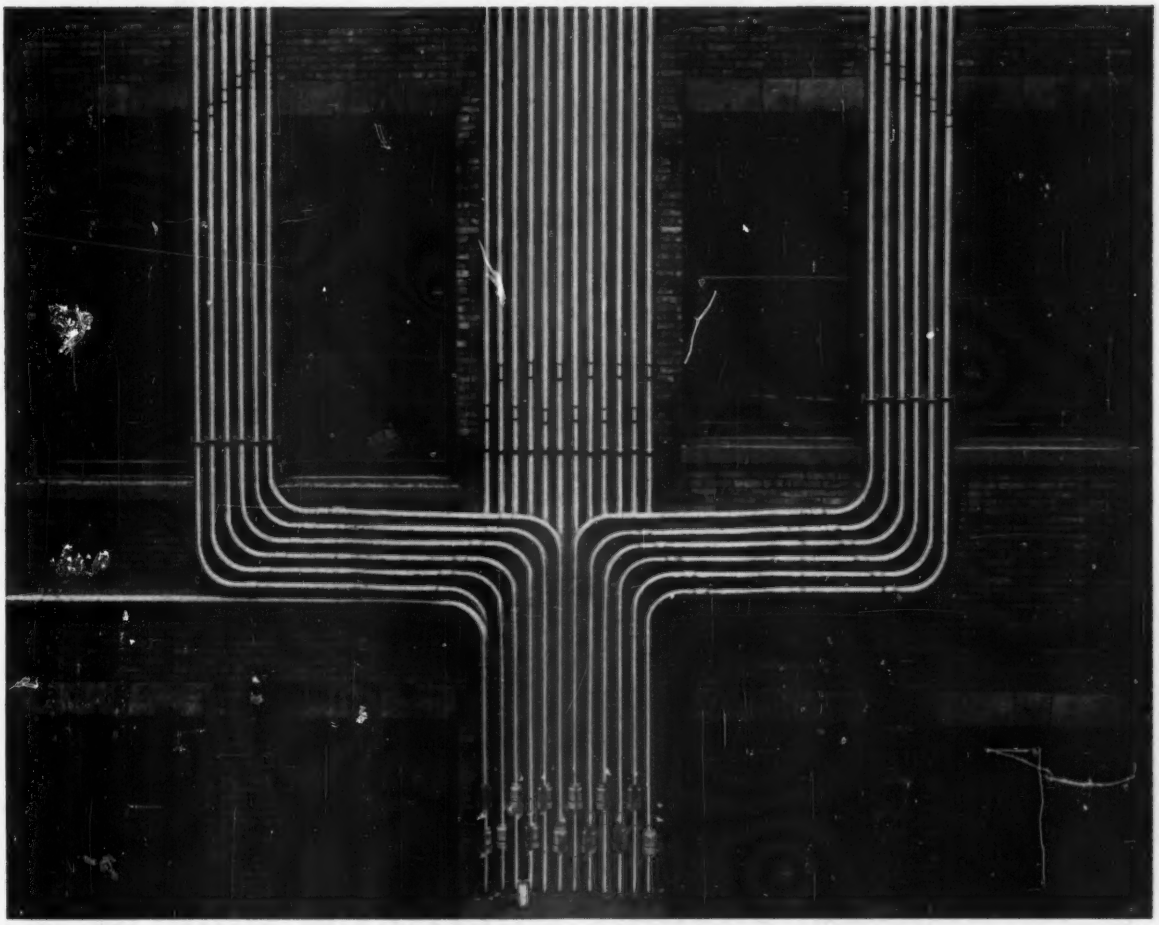
NORTH CAROLINA

W. E. Matthews Company
Laurinburg, North Carolina
¶ Water and sewer system improvements, Red Springs, N.C. (civil) Water extensions ($40,000); sewer extensions ($70,000); .5 mgd sewage disposal plant ($130,000). Client, Red Springs, N.C.

OHIO

G. E. Villena-Engineers
Cincinnati, Ohio
¶ County sheriff office and garage. (civil, struc.) $220,000. Client, Glaser & Myers, Architects.

F. H. Pasiadis & Associates
Cleveland, Ohio
¶ Office building, Cleveland, Ohio. Basement and two stories, completely air conditioned with 100-ton Freon compressor and water chiller, gas-fired hot water boiler with fintube radiation. (mech.) $600,000. Client, Bell Building.
¶ Masonic Temple building, Shaker Heights, Ohio. Basement and two-story



Why Alcoa Aluminum Rigid Conduit Proved to Be the Best Buy for an Ebasco Remodelling Job

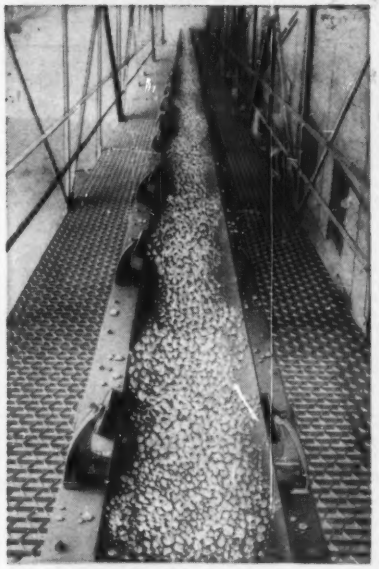
In planning to expand the electrical capacity of a 26-story New York office building, the budget dictated that existing external shutter brackets be used for conduit suports. It was doubtful that they would support the weight of steel conduit. The only alternative was a more expensive breaking through of walls and floors inside the building.

The solution proved to be Alcoa® Aluminum Electrical Rigid Conduit. Twenty-four 2½-in. risers were installed on the exterior of the building from painter's scaffolds. The light weight of aluminum conduit made the job easier and faster and reduced labor costs. Further, no maintenance should ever be necessary because aluminum resists corrosion and staining and will never need painting.

For new plants and offices, too, new low prices in all sizes can make aluminum your most attractive conduit buy. Alcoa Rigid Conduit in sizes up to 6 inches is furnished with color-coded thread protectors to tell conduit size at a glance. For more information, call Alcoa, or contact your Alcoa Conduit Distributor. Aluminum Company of America, 2328-M Alcoa Building, Pittsburgh 19, Pa.

Your Guide to the Best in Aluminum Value

STUMBLING HAZARD ELIMINATED



Spilled materials on a solid walkway caused workmen to stumble and turn ankles. Installation of 80% open Irving Mesh Grating allowed materials to fall through and minimized the hazard.

★

For Safe, Strong, Slip-Proof Stair Treads Specify

IRVING "VIZABLEDG" TREADS

★

Manufacturers of Riveted, Pressure-Locked, and Welded Gratings of Steel, Aluminum and other metals.

"A FITTING GRATING FOR EVERY PURPOSE"

IRVICO

IRVING SUBWAY GRATING CO., Inc.
Originators of the Grating Industry

Offices and Plants at
5056 27th St., LONG ISLAND CITY 1, N. Y.
1856 10th St., OAKLAND 23, CALIFORNIA

high masonry building completely air conditioned with two 20-ton packaged water chillers and four air supply units for zoning, gas-fired hot water boiler and radiation included. (mech.) $250,000. Client, Shaker Masonic building assoc.

PENNSYLVANIA

Buchart Engineering Corporation
York, Pennsylvania
¶ 1.23 miles of four-lane divided highway connecting new North-South bypass to limits of City of York. (civil) $1,250,000. Client, Pennsylvania Department of Highways.
¶ Water distribution and sewer disposal system design for Governor Pinchot state park, York county, Pa. (civil) $200,000. Client, Department of Forest and Water.

Chester Valley Engineers
Paoli, Pennsylvania
¶ Prestressed bridge. (civil, struc.) $24,000. Client, Skippach township.
¶ Prestressed bridge. (civil, struc.) $20,000. Client, London Grove township.
¶ Supermarket, Sharon Hill, Pa. (struc.) $200,000. Client, American Stores Co.
¶ Garden apartments, Paoli, Pa. (struc.) $100,000. Client, William Barrett, bldr.

McCormick, Taylor Associates
Philadelphia, Pennsylvania
¶ City hall annex, Philadelphia, Pa. (struc.) $15 million. Client, V. Kling.
¶ Office building, Bala Cynwyd, Pa. (struc.) $10 million. Client, Aaron Colish.
¶ St. Joseph's college faculty house, Philadelphia, Pa. (struc.) $350,000. Client, Henry D. Dagit and Sons.

Gustav Stueber, P.E.
Pittsburgh, Pennsylvania
¶ Music and science building, women's dormitory, men's dormitory, steel and masonry buildings, Indiana State Teachers college, Indiana, Pa. (struc.) $2 million. Client, Joseph Hoover, Architect.
¶ Addition and alteration to Miller's, Charleroi, Pa., steel and concrete work and fire tower modernization. (civil, struc.) $100,000. Client, John Schurko, Architect.
¶ Bower Hill elementary school 2, Chartiers Valley Joint School authority, Scott township, Allegheny county, Pa. (struc.) $1 million. Client, Joseph Hoover, Arch.
¶ Rectory for Saint Mary's Byzantine Catholic church, Monessen, Pa. (struc.) $125,000. Client, H. Ernest Clark, Arch.
¶ Expansion program for Lock-Foid Paper Box Company, Charleroi, Pa. (civil, struc.) $2 million. Client, B. D. Tranavsky, Architect.
¶ School addition and alteration to existing church, Saint Philomenos parish, Beaver Falls, Pa. (struc.) $500,000. Client, Wallover Petz & St. Jean Associates, Architects.
¶ Saint Mary's Byzantine Catholic church, Monessen, Pa. (struc.) $300,000. Client, H. Ernest Clark, Architect.
¶ Charleroi fire department. (struc.) $250,000. Client, B. D. Tranavsky, Arch.

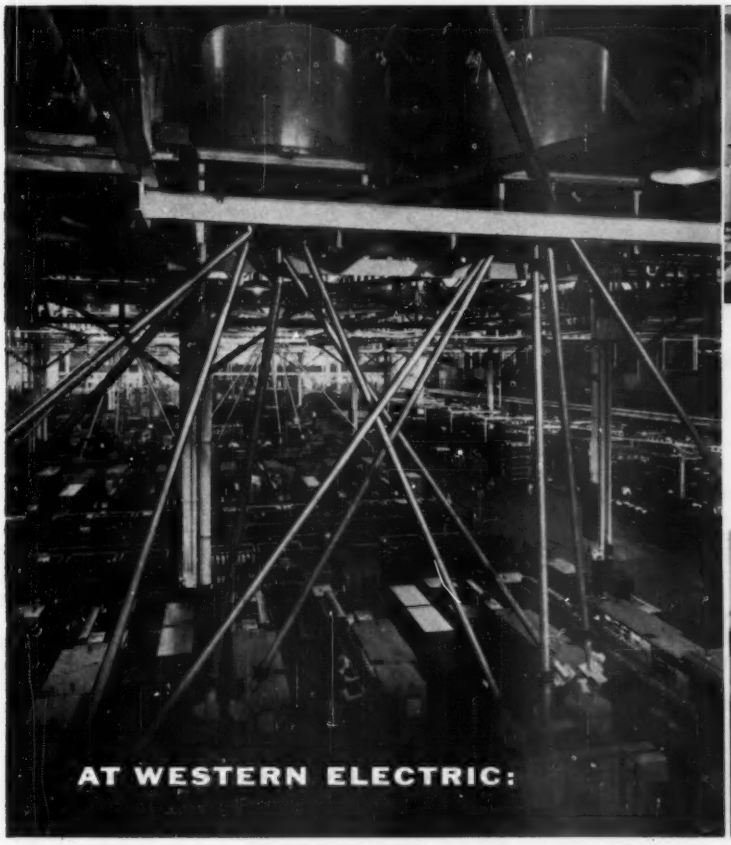
Walker-Yeomans Associates, Inc.
Philadelphia, Pennsylvania
¶ Boiler plant, electrical distribution, substations, Kennett Square, Pa. (struc., mech., elec.) Client, Longwood Gardens.
¶ Research and development building, Radnor, Pa. (struc., mech., elec.) $1.8 million. Client, Wyeth Laboratories, Inc.
¶ Research and development building, Philadelphia (struc., mech., elec.) $1.7 million. Client, Leeds & Northrup Co.

Godfrey Engineering
Washington, Pennsylvania
¶ Expansion program, Lock-Fold Paper Box Company, Charleroi, Pa. (mech., elec.) $700,000. Client, B. D. Tranavsky, Architect.

William E. Sees, Jr.
Harrisburg, Pennsylvania
¶ Sewage treatment plant and sewerage system, Dover, York County, Pa. (civil) $425,000. Client, Dover Borough Municipal Authority.
¶ Sewer extensions, East Berlin, Adams county, Pa. (civil) $15,000. Client, East Berlin Municipal Authority.
¶ Sewer extensions, McSherrystown, Adams county, Pa. (civil) $20,000. Client, McSherrystown Borough Council.
¶ Bowling alley, R. D. Mechanicsburg, Cumberland county, Pa. (civil) $215,000. Client, Trindle Bowling Center.
¶ House plans, Camp Hill, Pa. (civil) $30,000. Client, Joseph Galer.
¶ House plans, York, Pa. (civil) $25,000. Client, Frank Puza.
¶ Four-unit apartment, York, Pa. (civil) $75,000. Client, Frank Puza.
¶ Swimming pool, Riverside, Northumberland county. (civil) $40,000. Client, Kipps Run Swimming Club.
¶ Sewage pumping station, Lower Paxton township, Dauphin county, Pa. (civil) $10,000. Client, Blue Ridge Sports Club, Inc.
¶ Housing development, Wormleysburg, Cumberland county. (civil) $6 million. Client, Riverview.
¶ Housing development, Selingsgrove, Snyder county, Pa. (civil) $4.5 million. Client, Fairview.
¶ Housing development, Susquehanna township, Dauphin county, Pa. (civil) $450,000. Client, Wedgewood Hills.
¶ Property surveys in Cumberland, Dauphin, Perry, Adams, York, Snyder, and Mifflin counties. (civil) Client, various realtors.
¶ Streets and curbing in above counties. (civil) $250,000 (est.) Client, various municipalities.

TEXAS

William E. Wallis
San Antonio, Texas
¶ Additions to three schools, Del Rio independent school district, Del Rio, Texas. (mech., elec.) $350,000 Client, Hesson & May, Architects.
¶ New Alamo Heights junior high school, Alamo Heights, Texas. (mech., elec.) $580,000. Client, H. D. Smith & Associates, Architects. ▲▲



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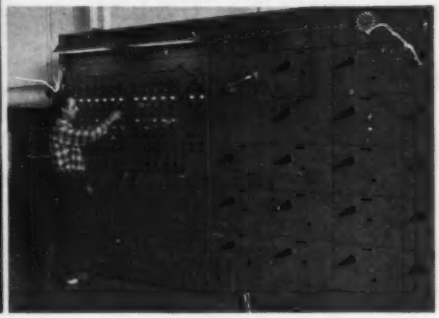

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Books

For the Libraries of Consulting Engineers

COMPOSITE CONSTRUCTION IN STEEL AND CONCRETE FOR BRIDGES AND BUILDINGS, by I. M. Viest, R. S. Fountain, and R. C. Singleton; McGraw-Hill Book Co., New York; 176 pp.; $7.50.

Reviewed by
R. W. Sauer, Supervisor
Structural Analysis Section
Armour Research Foundation

In preparing this book on composite design the authors have tried to present both a basic text on composite design and a manual for designers. Separate volumes would have served their purpose better.

The basic text material suffers somewhat from brevity. Code requirements are introduced without substantiating background information. On the other hand, a design manual should be brief and self-explanatory. The design aids in this book are given in a chapter separated by 128 pages from the nomenclature and by more than 100 pages from materials referred to.

Although the reviewer has some quarrel with the method of presentation, the merits of the contents are not questioned. Two major problems are encountered in composite beam design — selection of an appropriate cross section, and the design of proper shear connectors between the steel beam and concrete slab. Methods are presented for determining the cross section of the beam. However, one method is applicable only to rolled beams, whereas a second applies to rolled steel sections with or without cover plates, built-up sections.

Shear connectors are treated in some detail. Formulas are presented which allow the design of stud, channel, and spiral connectors; a comparison of the three is made based upon test data.

One chapter which should prove of value to the designer who is new to composite structures, contains a series of solutions to specific design problems. Six examples are given, ranging from a simple span with rolled sections to a four-span continuous bridge with welded plate girders. However, the book presents nothing basically new or different in the approach to design of composite structures.

Most of the book is concerned with design of bridges; throughout the AASHO specifications are used. Discussion of application of composite design to buildings is relegated to an appendix.

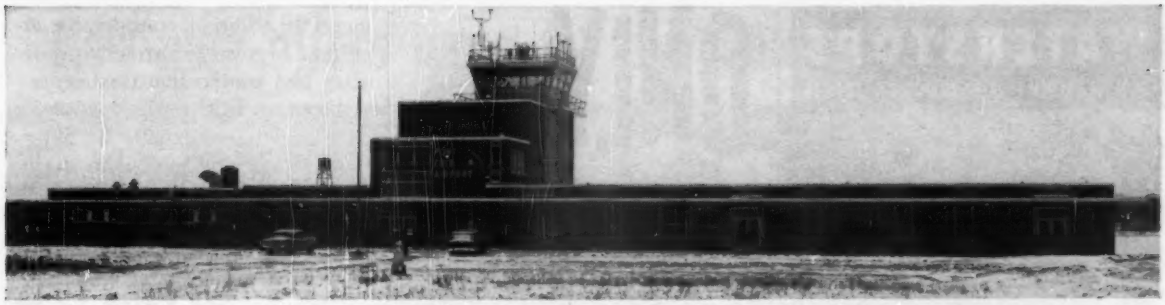
•

TECHNOLOGY OF COLUMBIUM (NIOBIUM), edited by B. W. Gonser and E. M. Sherwood; John Wiley & Sons, Inc.; 120 pp; $7.00.

Reviewed by
F. W. Boulger
Battelle Memorial Institute

The title of this book sidesteps the controversy on adopting a single name for Element 41.

The volume contains 17 of the papers presented at a symposium on columbium (niobium) held by The Electrochemical Society in May 1957 and provides up-to-date information on the economic aspects and on the supplies of the



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Heidt, Erie, Pa.

ENGINEER:
Don Kennedy

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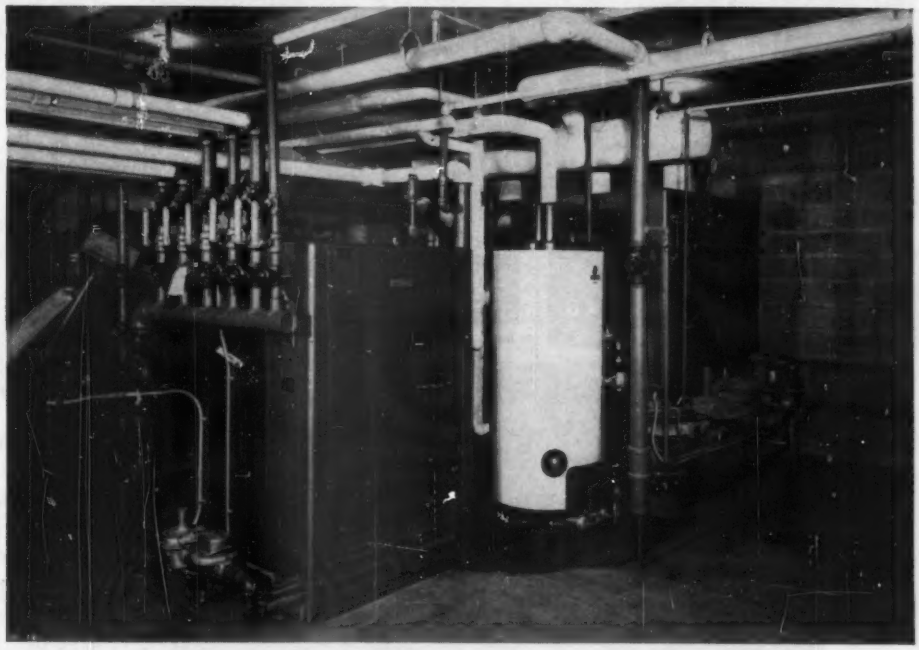

Send for engineering data on Weil-McLain Gas and Oil Boilers for Commercial and Industrial Heating Systems. Address Dept. DD-128.

In this unusual installation, Weil-McLain Boilers were the choice to serve two airport needs. The "HR" Boiler at the right is used for space heating and the Type "J" Gas Boiler for the snow melting system. This arrangement, instead of the more conventional method of installing a snow melting system converter on a single boiler, was due to certain restrictions on the use of gas.

In the Erie, Pa., airport area, gas-fired space heating boilers above a certain size must be equipped to use a standby fuel. The Weil-McLain "HR" Boiler therefore has a combination oil and gas burner. In the event of a gas shortage, the "J" boiler handling the snow melting system would not operate, but the function of space heating could be continued by switching the "HR" boiler to oil firing.

This dual purpose installation also made a saving in original equipment cost.

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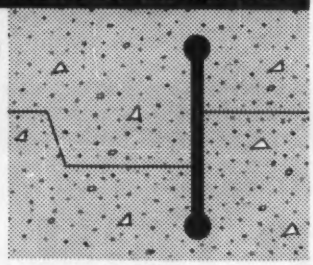

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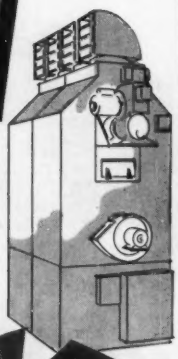

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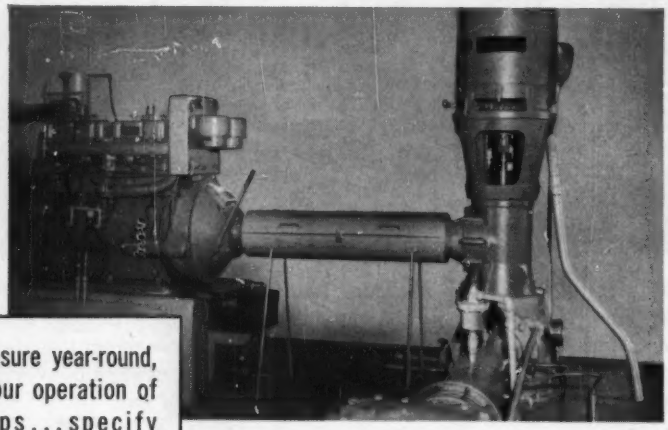

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4

metal. In addition, considerable attention is given to extractive processes and purification treatments.

About a fifth of the text deals with analytical methods for determining impurities and with oxidation studies on columbium and its alloys. Much of the remainder is devoted to defining the physical and mechanical characteristics of the element and certain columbium-base alloys. As is natural for a symposium on a metal of limited current application, although of growing importance, the data are more useful for scientists.

Two of the authors discuss the imports, sources, consumption, and probable prices of columbium at various levels of demand. The world reserves of columbium-containing minerals far exceed the most optimistic estimates of future requirements. Several of the large known deposits are located in Canada, Brazil, and the United States.

Much of the interest in columbium stems from the fact that the element has moderately good properties justifying its consideration for applications not met by common metals. Various authors point out that columbium can be cold worked quite easily and describe techniques for electroplating. One article describes the textures of rolled and recrystallized alloys of fairly high purity. Another covers the effects of temperature, strain rate, minor alloying, and microstructure on strength. At the same general level of impurity, columbium is less subject to brittle fracture than molybdenum, tungsten, and chromium.

Although columbium and its alloys are expected to have good strength at temperatures up to about 2000 F, the element oxidizes rapidly. Three of the articles in the symposium cover investigations aimed at overcoming this severe limitation for high-temperature applications. All of the authors report sufficient progress to justify continued effort toward producing a suitably oxidation-

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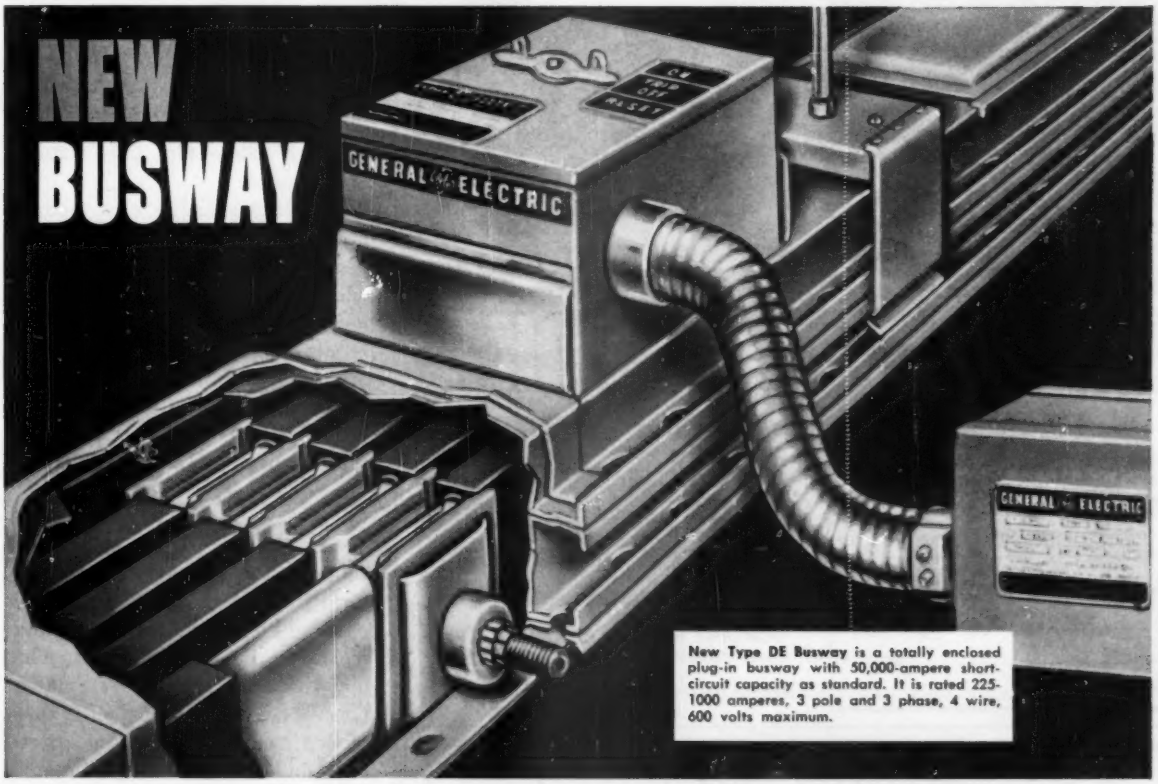

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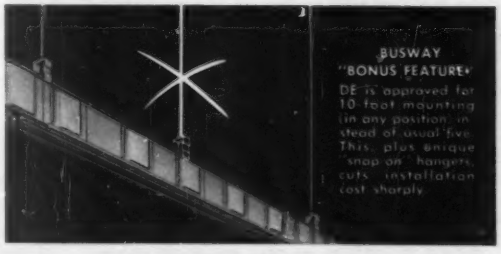
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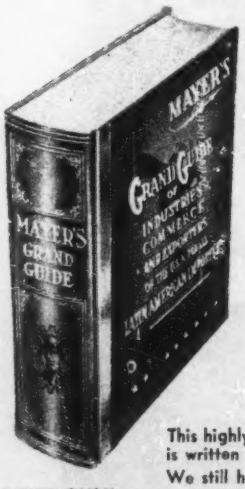

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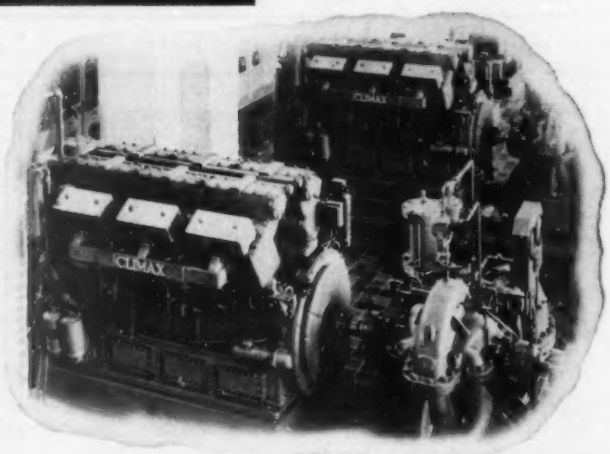

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Date	Sponsor	Event	Location
Dec. 1-3	American Society of Refrigerating Engineers	Semiannual Meeting	Hotel Roosevelt New Orleans, La.
Dec. 3-4	Building Research Institute	Field Applied Paints and Coatings Conference	Shoreham Hotel Washington, D. C.
Dec. 8-10	American Nuclear Society	Winter Meeting	Sheraton-Cadillac Hotel Detroit, Mich.
Jan. 14-15	Building Research Institute	Conference on Noise Control in Buildings	Hotel New Yorker New York, N.Y.
Jan. 24-27	Consulting Engineers Association of California	Sixth Annual Meeting	Mark Thomas Inn Monterey, Calif.
Jan. 26-27	American Society of Lubrication Engineers	Gear Symposium	Morrison Hotel Chicago, Ill.
Jan. 26-29	American Society of Heating & Air Conditioning Engineers	Fourteenth International Heating & Air Conditioning Exposition	Convention Hall Philadelphia, Pa.
Feb. 1-4	American Society of Heating and Air-Conditioning Engineers	Annual Meeting	Baker and Adolphus Hotels Dallas, Texas
Feb. 1-6	American Institute of Electrical Engineers	Winter General Meeting	Statler Hotel New York, N.Y.
Feb. 3-5	Society of the Plastics Industry, Inc.	Reinforced Plastics Division Conference	Edgewater Beach Hotel Chicago, Ill.
Feb. 9-13	American Society of Civil Engineers	Los Angeles Convention	Hotel Statler Los Angeles, Calif.
Feb. 19-21	National Society of Professional Engineers	Winter Meeting	Dinkler-Tutwiler Hotel Birmingham, Ala.
March 3-5	American Institute of Electrical Engineers	Western Joint Computer Conference	Fairmont Hotel San Francisco, Calif.
March 29-April 1	American Society of Mechanical Engineers	Instruments and Regulators Conference	Case Institute of Technology Cleveland, Ohio
April 5-10	Engineers Joint Council	Nuclear Congress	Municipal Auditorium Cleveland, Ohio

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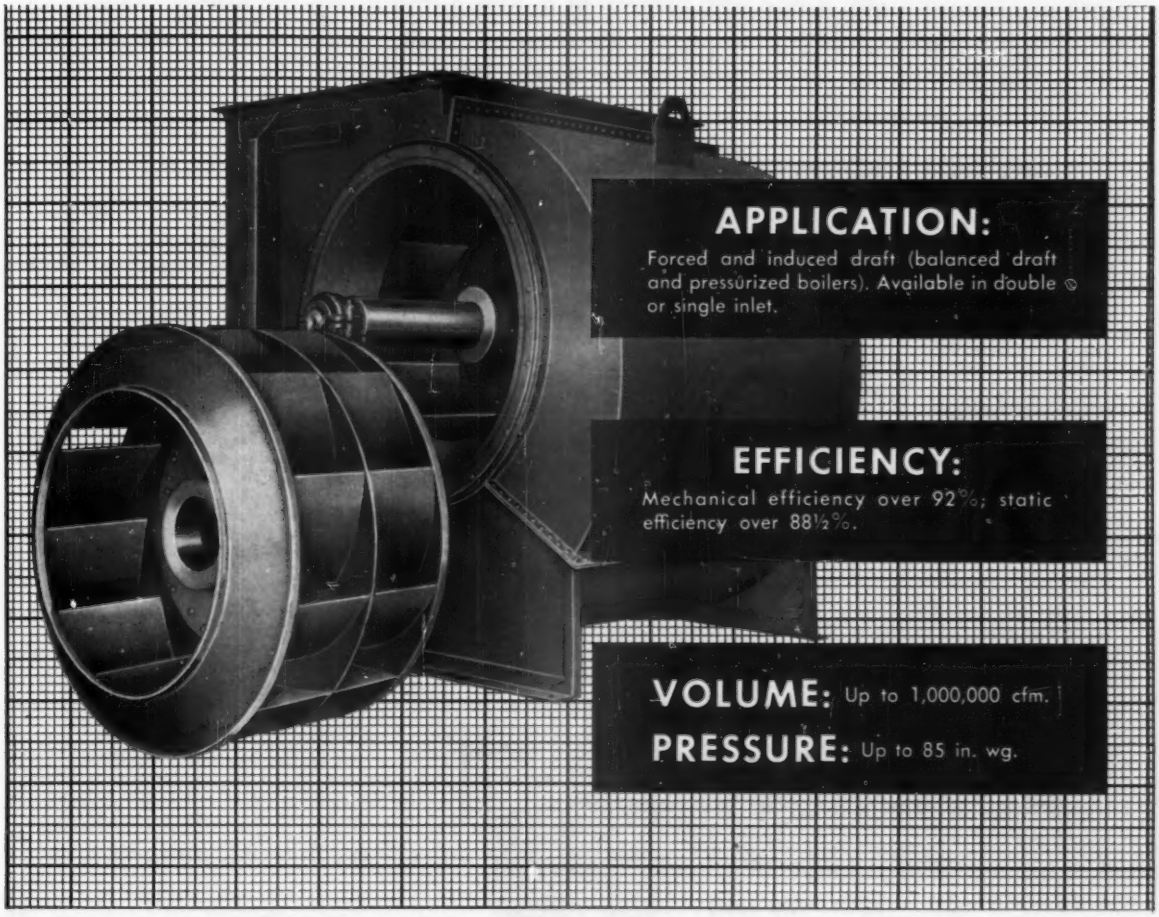
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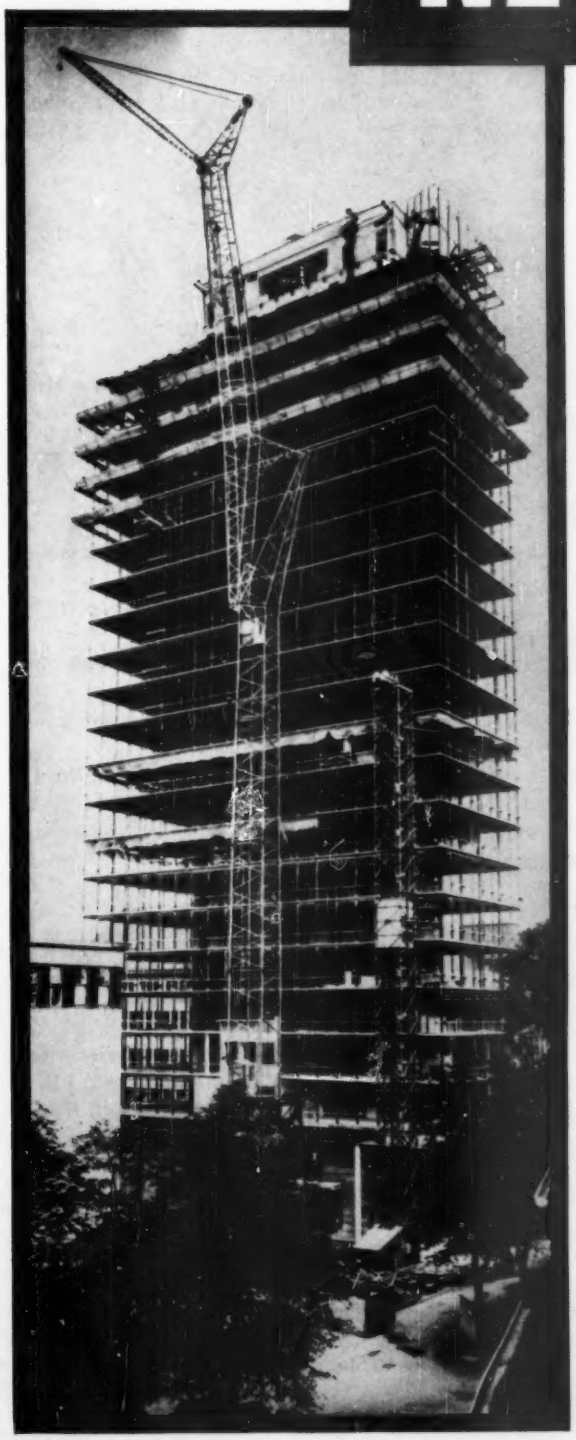

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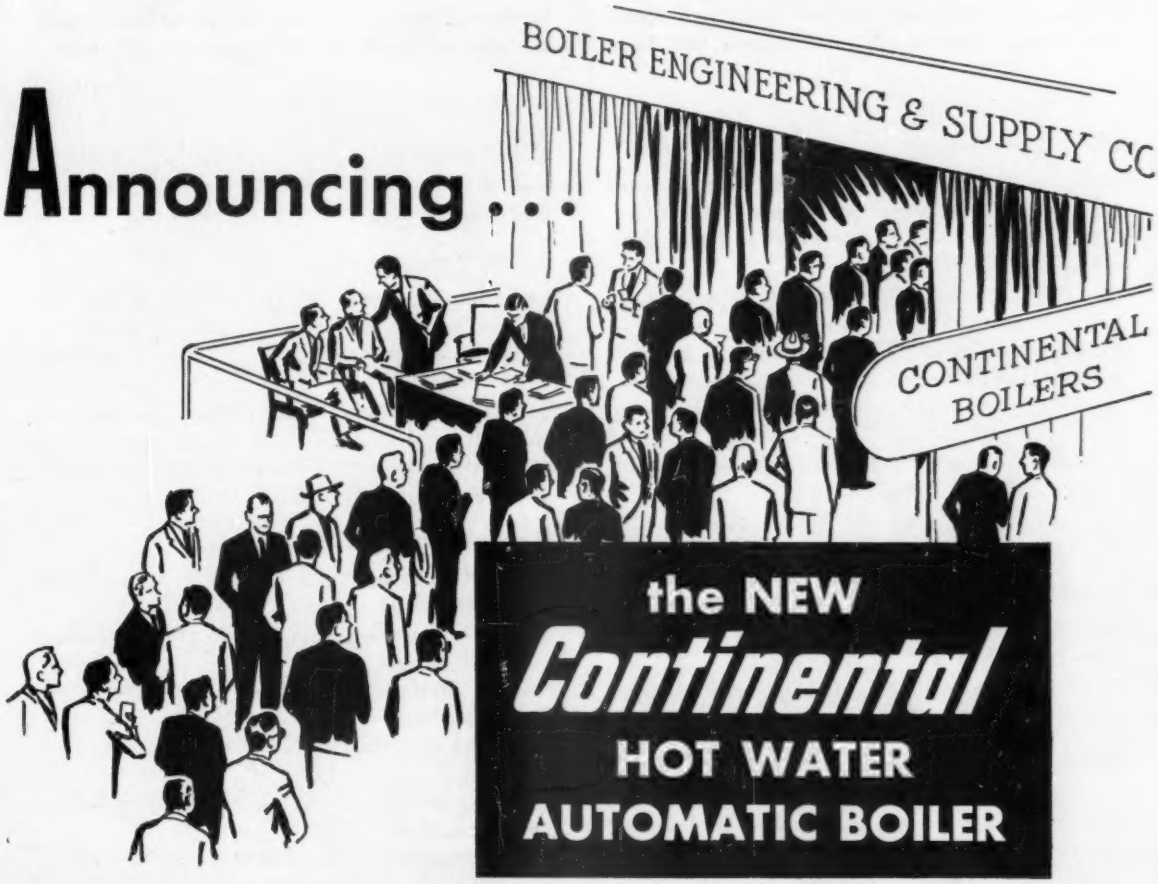

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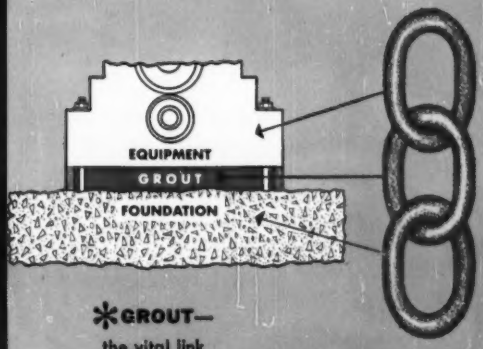

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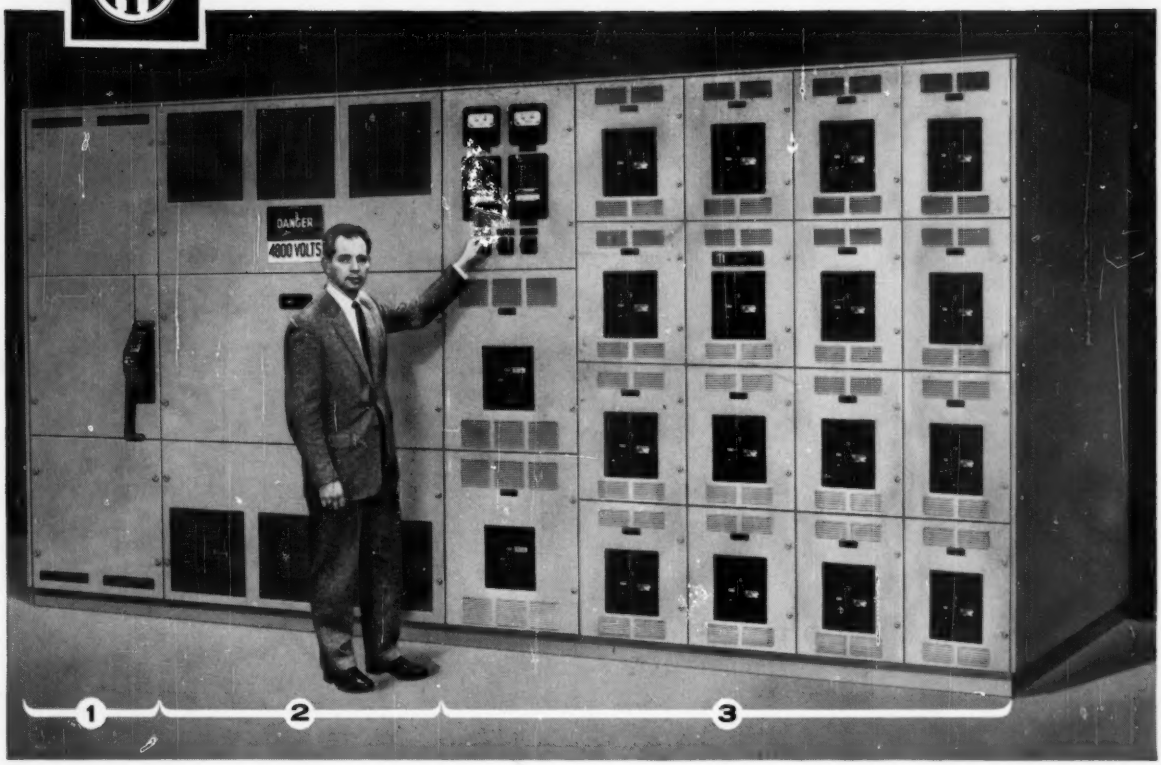

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